ENVIRONMENTAL STANDARDS IN THE TEXTILE AND SHOE SECTOR

A GUIDELINE ON THE BASIS OF THE BREFS – BEST AVAILABLE TECHNIQUES REFERENCE DOCUMENTS OF THE EU

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For our Environment

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FOREWORD

BEST AVAILABLE TECHNIQUES FOR THE TEXTILE AND SHOE SECTOR: LOWER COSTS AND SECURE SALES MARKETS WITH ENVIRONMENTAL PROTECTION

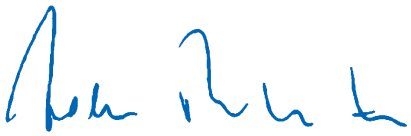
Today it is well known how to produce textiles and shoes in a manner that is as environmentally friendly as possible. This is also clear to consumers. They are becoming less and less willing to bear environmental risks – much in the way that they have already demonstrated with regard to inadequate social standards. According to the 2010 Environmental Awareness Study of the Federal Environment Agency (UBA), two in three of respondents specifically buy products whose manufacture harms the environment as little as possible. Environmental labels such as the "Blue Angel" for textiles and shoes are an aid in these purchasing decisions. Consequently, one goal of trade and industry must be to protect our environment more effectively and avoid losing the bulk of consumers. This guideline shows traders and producers the way.

Three aspects characterise the guideline in particular. One of these is that leading manufacturers and traders in the textile and shoe industry are working together with associations and the UBA in Germany for the first time. This is something that I expressly welcome, as these stakeholders not only steer their own production. They can also influence the behaviour of their subcontractors - often in developing and emerging countries. Import statistics show the influence, and therefore the responsibility, that companies have here: in 2009 the European Union imported clothing made from knitted and woven textiles to the value of almost 28 billion euros from countries outside of the EU.

In addition, the guideline refers directly to industrial reality. It outlines the „best available techniques" (BAT) regularly jointly specified by the EU member states, industrial and environmental associations. The BREFs – Best Available Techniques Reference Documents - form the basis for permission of environmentally-relevant industrial plants in the EU and have proved their value over many years. If importers now join with their subcontractors in gradually implementing that which is respected within the EU and requested by consumers, this will promote global environmental protection all the more.

The third aspect: the guideline makes clear that operational environmental protection pays off – and frequently without great expense. Paying attention to non-leaking pipes, well-calibrated dosing systems and the manufacturer details for chemicals can result in clear cost savings. A simple change in washing processes can result in water savings of up to 75 percent. In 2012 the UBA is set to publish a detailed BAT checklist that will also help producers to achieve these savings targets.

Operational environmental protection applies in every stage of the textile and shoe production chain – if this guideline and the stakeholders from industry, trade and society involved with it pass on this message, then more and more producers will follow in their footsteps. Even though fair working conditions in textile and shoe production are not the focus of this brochure: improving environmental and social standards need to interlink and overlap as a matter of course – as part of a sustainable development.



Jochen Flasbarth, President of the Federal Environment Agency

BAT GUIDELINE – IN BRIEF

WHO IS THIS GUIDELINE AIMED AT?

This guideline is aimed at you as a company in the textile or shoe production chain - particularly where you feel that the following descriptions apply to you:

- As a player in the global textile chain or shoe manufac turing you also supply the European market.
- You would like to implement environmental standards more effectively because consumers in your sales markets, your trading partners or your customers in the processing industry request this. However, you do not yet know how you can realise this.
- You are interested in environmental protection measu res that also lower your operating costs or at least pay for themselves in the medium term.
- You are looking for a way to integrate environmental protection on the one hand whilst also improving your image effectively to attract new customers and staff.

WHAT IS IT ABOUT?

In the major consumer markets of the industrialised countries environmentally-friendly manufacturing technology is becoming a product characteristic that is as sought-after as material or processing quality. And this is not undeserved, as the consequences of environmentally-detrimental business threatens humanity as a whole, and more and more consumers are aware of this.

For this reason, this brochure aims to show you that it is not only the environment that benefits from the best available techniques (BAT) for environmentally-friendly production, but first of all your company. To illustrate this, this guideline details numerous approaches, which techniques you can integrate into which production stages and the savings effects - very rapid in some cases - that can be achieved without the need for high investments.

WHAT ARE THE „BEST AVAILABLE TECHNIQUES"?

Worldwide there are already a number of consulting offers regarding environmental protection in the textile and shoe industry. The particular approach of this guideline: it is oriented towards the BREFs – Best Available Techniques Reference Documents – the largest practice-proven trove of experience worldwide for technical environmental protection, which is developing further continuously.

„The worldwide production of shoes or textiles needs to focus more strongly on the areas of sustainability and environmental protection in future. Transparency, staff training and the regular recording of environmental data are important prerequisites for sparing the environment and achieving financial success at the same time."

Stefan Seidel, PUMA AG

In the European Union the application of best available techniques is a condition for a production permit. Companies that already implement environmentally-friendly techniques are also of interest for the importers of private labels and industry in the search for suppliers outside of the EU. This guideline shows you the first steps towards placing your company in a good position for it.
This guideline only introduces selected measures from the range of best available techniques.

Your engineers can find technical details for all best available techniques - including those not named here - in the extensive BREFs themselves. Free BAT downloads are available from the European Commission (http://eippcb.jrc.es/reference) and the Federal Environment Agency (www.bvt.umweltbundesamt.de).

THE INITIATORS OF THIS GUIDELINE

For this practice guide the Federal Environment Agency has joined together for the first time in Germany with stakeholders from industrial and social fields to collaborate on the subject of environmental standards in the textile and shoe sector. It was the input and contributions of each of the following representatives that enabled the practice-relevant guide to be created:

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adidas Group
C&A Mode GmbH & Co. KG
Deichmann SE
GIZ Deutsche Gesellschaft für Internationale Zusammenarbeit GmbH
Hess Natur-Textilien GmbH
Hydrotox GmbH
IKEA Deutschland GmbH & Co. KG
JACK WOLFSKIN AUSRÜSTUNG FÜR DRAUSSEN GMBH & Co. KGaA
LIDL Stiftung & Co. KG
PUMA AG
REWE Group
s.Oliver Bernd Freier GmbH & Co. KG
Systain Consulting GmbH
Tchibo GmbH
VAUDE Sport GmbH & Co. KG

Gesamtverband der deutschen Textil- und Modeindustrie e. V.
HDS – Bundesverband der Schuhindustrie e. V.
Prüf- und Forschungsinstitut Pirmasens e. V.

Bund für Umwelt und Naturschutz Deutschland
Kampagne für saubere Kleidung
terre des hommes Deutschland e. V.
vzbv Verbraucherzentrale Bundesverband e. V.

ENVIRONMENTAL STANDARDS PAY OFF

The BREFs advise manufacturing companies: allow technological improvements and the methods of the environmental management system to work hand in hand. Your operational environmental management not only prepares the ground for corresponding technical measures such as the integration of environmental standards in production.

It also has a far broader effect: for example in sales, personnel management or marketing. Instruments such as the quality management standards EN ISO 9000 ff, the environmental management standard EN ISO 14001 or the European EMAS (Eco-Management and Audit Scheme) will support you in this.

ACQUIRE NEW MARKETS – SECURE EXISTING ONES

As a supplier in the textile and shoe industry, your chances of acquiring new sales markets and securing existing ones will rise if you can demonstrate better environmental performance than your competitors. Consumers are increasingly looking for products that cause no environmental damage in their manufacture, use and disposal (Environmental Awareness Study 2010, UBA). As a result, trading companies and branded companies are increasingly marketing their products with additional ecological benefits.

Keep up with this global development and integrate corresponding environmental standards into your production.

LOWER PRODUCTION COSTS

Operational environmental management and good housekeeping on their own can save a company large quantities of energy, raw materials or waste – at little or no effort or expense. Further technically demanding measures may require greater input of personnel and funds. However, here too, the effects will pay off in the medium and long term. The more efficiently your company uses energy, fresh water or chemicals, the less its impact on the environment. And your costs are reduced at the same time.

The most important savings potential:

- Lower costs thanks to savings in resources such as energy and water.
- Lower spending, for example on raw materials or chemicals, through more efficient use.
- Lower spending on waste water and waste air treatment.
- Lower spending on disposal thanks to lower volumes of waste and better sorting for recycling.
- Lower spending on the purchasing of raw materials thanks to the efficient use of materials and the recycling of production waste.

Use this guideline to help you calculate: many environmental protection measures pay for themselves after just a short time.

COMMERCE AND BANKS CALL FOR ENVIRONMENTAL STANDARDS

Civil society organisations and the press keep a close eye on the environmental management of manufacturing industry – even beyond the realm of international production chains. In the past, campaigns against companies that abuse social standards have repeatedly led to loss of sales and damage to image. Textiles or shoes manufactured under poor or lacking environmental standards are similarly affected. For this reason, traders and branded companies are increasingly on the lookout for suppliers that fulfil high environmental requirements.

Similarly, banks and other investors calculate the risks of a possible environmental burden precisely when issuing credit to companies.

For example, the International Finance Corporation (IFC) – a subsidiary of the World Bank and the world's largest source of credit for private industrial projects - obliges its borrowers to take account of environmental protection requirements that are also based upon the BREFs.

Make your company an attractive partner for trade and banks: document the orderly operation of your production in accordance with international environmental legislation and minimise the risk to your own liability and reputation in the process.

DO GOOD AND TALK ABOUT IT

„We produce textiles and shoes in an environmentally-friendly manner" – the more tangibly you communicate this environmental commitment within and outside your company, the stronger the positive effect of your involvement will be beyond environmental protection itself. The strategies and measures of public relations (PR) will help you in this.

„Thanks to certification through environmental and social labels everyone - from supplier to consumer - has a clear orientation and alternatives for action."

Barbara Küppers, terre des hommes Deutschland e. V.

„The implementation of environmental and social standards creates trust amongst customers and offers companies security against public attacks from workers' associations and NGOs."

Christiane Schnura, Kampagne für Saubere Kleidung

Raising your own recognition levels, becoming more strongly accepted and frequently favoured as a trading partner, gaining a reputation as an opinion leader in the sector – in brief: establishing trust – these are all communication goals that you can achieve more easily with the targeted declaration of your environmental management.

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- Existing and potential trading and manufacturing partners.
- Customers of your customers – including, for example, the private label that drives „your" textile or shoe production chain..
- Investoren.
- Civil society at your location.

Your environmental commitment has a high value for all of these dialogue groups – whether it is as a sign of innovation, qualitative reliability, know-how, sustainability or social responsibility.

The precise message that you direct at „your" dialogue group and the strategy that you wish to use for this - for example active dialogue, informing or reaction - depends on the individual circumstances.

The press is an important communications channel for reaching your dialogue group. For this reason you should inform the editorial offices of the trade press of the environmental activities at your company – just as many companies in this guideline do with their good practice examples. Or inform the local press at your location of the measures you are taking to ensure clean water, clean air and better training for your workforce. Make sure that you do not undertake any greenwashing. The press

is just one of many effective communications channels. Check whether you can also present your environmental management on the internet. Seek out partnerships with associations or start a company initiative yourself on the theme of environmental standards.

Check if you can be certified for nationally or internationally-recognised product labels. Independent environmental labels enjoy great trust – amongst business partners as well as consumers. In the appendix you will find sources for further information on this theme.

Do not be afraid to approach the PR departments of major private labels that ultimately market your product. These companies are often interested in your good practice examples themselves, to integrate them into their own brand PR. Unfortunately, it is often difficult for large branded companies to research the complex supply chains of their general and sub importers. This is your opportunity to put yourself in a favourable light.

„Comprehensive PR work and an EMAS-conform sustainability report are good opportunities to lend your company transparency and trustworthiness."

Hilke Patzwall, VAUDE Sport GmbH & Co. KG

THE BEST AVAILABLE TECHNIQUES FOR TEXTILE AND SHOE PRODUCTION

„With the maintaining of environmental standards and the achieving of own sustainability goals companies not only avoid risks to image and consequently sales, but can also increase the energy and resource efficiency of their value chains."

Stefan Dierks, Tchibo GmbH

„The BREFs should be globally-valid references for the operation of industrial plants."

Markus Reinken, LIDL Stiftung & Co. KG

„For years now we have been observing a continuous increase in demand for goods produced in an environmentally-friendly manner. Anyone turning a blind eye to this will lose key groups of buyers."

Astrid Schödel, s.Oliver Bernd Freier GmbH & Co. KG

The European Union aims to achieve a high degree of environmental protection for especially relevant industrial branches in the member states of the EU. To this end, in 1996 it adopted the Integrated Pollution Prevention and Control Directive (IPPC Directive). The IPPC Directive – amended in 2010 by the Directive on Industrial Emissions – obliges many production facilities in the EU states to avoid or reduce emissions in the air, water and soil, as well as waste. To this end it foresees the best available techniques described in the so-called BREFs – Best Available Techniques Reference Documents. Without these techniques the plants concerned receive no operating permit.

As a reference for the operation of industrial plants the BREFs also apply beyond the EU as their area of legal validity. For example, the UN ECE (United Nations Economic Commission for Europe) uses the information from the BREFs in its protocols for the Convention on Long-range Transboundary Air Pollution, which specify the threshold values for environmental pollutants.

A BREF describes the technologies and procedures that are currently the most ecologically advantageous and economically practical for the respective plant type. These techniques are stipulated and updated at regular intervals, with the EU member states consulting industry and environmental bodies.

Processes of particular environmental relevance in the production of textiles and shoes are textile finishing and leather production. For these two production stages the BREFs "Textile industry" and "Tanning of hides and skins" describe detailed environmentally-friendly techniques.

	PRODUCTION OF RAW FIBRES		YARN PRODUCTION	GREY CLOTH PRODUCTION	TEXTILE FINISHING	MAKING UP
Process steps	Production of Natural fibres	Production of man-made fibres	Spinning, Twisting	Weaving Knitting	Pre-treatment Dyeing Printing Finishing	Cutting, Assembly, Finishing, Packing
Relevant environmental effects	Land use Pesticide Preservatives Water demand	Waste water pollution, Air emissions, poorly biode-gradable textile auxiliaries	Textile auxiliaries and chemicals use, Fibre waste, Noise pollution, Dust emissions	Textile auxiliaries and chemicals use, Noise pollution, Dust emissions, Waste, poorly biode-gradable sizing agents	Water demand , Waste water pollution, Textile auxiliaries and chemicals use, Air emissions, Energy demand	Energy demand Waste

From the raw fibre to the finished textile product: the key environmental effects of the textile industry

THE PRODUCTION OF TEXTILES AND SHOES PLACES A BURDEN ON THE ENVIRONMENT

The environmental effects of the textile industry

The textile and clothing industry is one of the most important industrial sectors worldwide. It is one of the oldest and most complex segments of manufacturing industry. Several hundred million employees work, primarily in small and medium-sized companies, to produce clothing, technical textiles (such as vehicle seat covers, tarpaulins or tyre fabrics) as well as house and home textiles (such as towels, bed linen or curtains). Every step required in processing has a resultant effect on the environment.

„Via optimised production processes it is generally possible to recoup the spending on sustainable environmental measures."

Manfred Junkert, HDS – Bundesverband der Schuhindustrie e. V.

The environmental effects of the shoe industry

The global shoe market has changed enormously. Of the over 2.8 billion pairs of shoes traded in the EU states in 2008 alone, 85 percent originated from production countries outside the EU – a figure that was just 60 percent in 2005 (Eurostat). Nine out of ten pairs of imported shoes were produced in Asia – particularly in China (72.6 %), and Vietnam (11.9 %). As is the case with textile production, the manufacture of shoes is broken down into numerous sub-stages, such as the manufacturing of the shoe and sole materials. Here too, emissions are generated in all of the individual stages, polluting air and water in particular.

	MANUFACTURE OF UPPER MATERIALS			MANUFACTURE OF BOTTOM MATERIALS			UPPER MANUFACTURING	SHOE ASSEMBLY	SURFACE TREATMENT
Process steps	Leather (scope of the BREF)	Fabrics from natural or man-made fibres	Plastics	Leather (scope of the BREF)	Rubber	Plastics	Cutting Preparing of parts Stitching of parts	AGO lasting Flexible lasting Strobel lasting direct injection	Cleaning/pre-treating of shoe, Waxing/ spraying polishing of shoe
Relevant environ-mental effects	Water demand/ Waste water pollution, Use of chemicals, Waste	Water demand/ Waste water pollution, Chemicals Waste	Waste Air emissi-ons (VOC)	Water demand/ Waste water pollution, Use of chemicals, Waste	Use of chemicals Air emissions (VOC)	Waste Air emissi-ons (VOC)	Air emissi-ons (VOC), Waste Use of chemicals	Air emissi-ons (VOC), Waste Use of chemicals.	Air emissions (VOC), use of chemicals Waste water pollution

From raw material to finished shoe: effects on the environment

BENCHMARKS: THIS IS HOW LITTLE THE MANUFACTURE OF TEXTILES AND SHOES SHOULD POLLUTE THE ENVIRONMENT

Every amount of energy, chemicals or water saved benefits the environment and reduces operating costs.
When estimating saving potential within your company sector-specific orientation values for emissions and waste can help, where these correspond to a good international industrial standard.

The benchmarks stated here are based on the statements of the Environmental, Health and Safety Guidelines „Textile Manufacturing" and „Tanning and Leather Finishing". The publisher of these guidelines, the International Finance Corporation, uses the BREFs as a key source of information in these.

Benchmarks in textile production

CONSUMPTION OF RESOURCES AND ENERGY

PROCESS	ELECTRICAL ENERGY (KWH/KG TEXTILE SUBSTRATE)	THERMAL ENERGY (MJ/KG TEXTILE SUBSTRATE)	WATER CONSUMPTION (L/KG TEXTILE SUBSTRATE)
Wool scouring	0,3	3,5	2–6
Yarn finishing	–	–	70–120
Yarn dyeing	0,8–1,1	13–16	15–30 (dyeing) 30–50 (rinsing)
Dyeing loose fibres	0,1–0,4	4–14	4–15 (dyeing) 4–20 (rinsing)
Finishing knitted fabrics	1–6	10–60	70–120
Finishing woven fabric	0,5–1,5	30–70	50–100
Finishing dyed knitted fabrics	–	–	<200

Source: IFC-EHS Guidelines „Textile Manufacturing"

AIR EMISSIONS

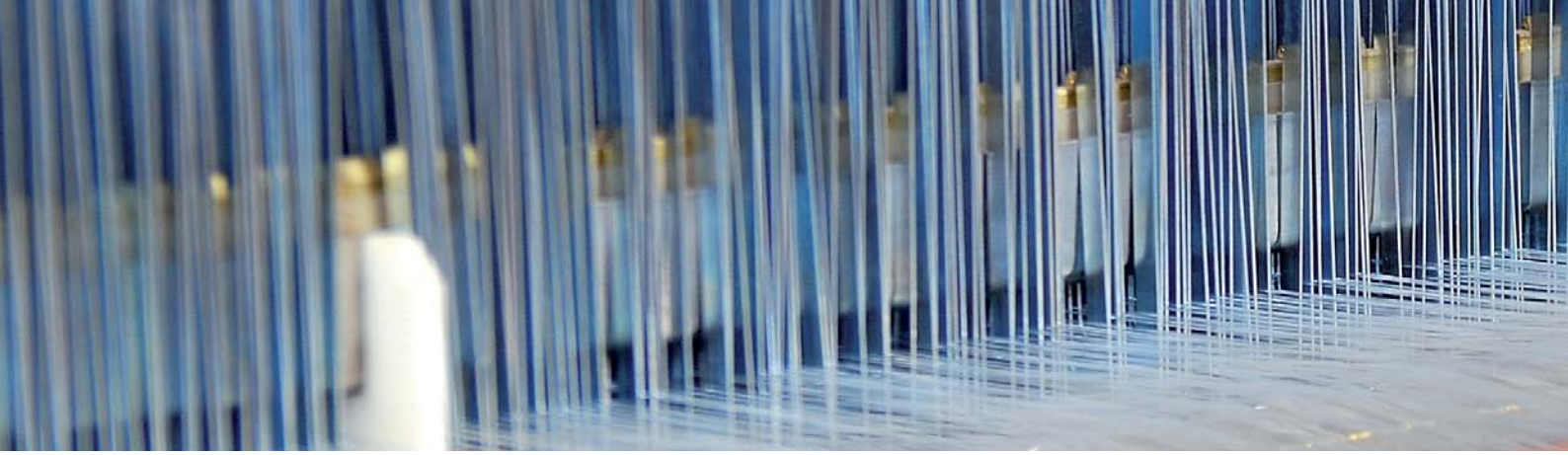
PARAMETER	EMISSION VALUE IN mg/Nm³
VOC	2 / 20 / 50 / 75 / 100 / 150 [a) b)]
Formaldehyde	20
Ammonia	30
Total dust	50

a) calculated as total carbon
b) As the 30-minute mean for stack emission:
- 2 mg/Nm3 for VOCs classified as carcinogenic or mutagenic with mass flow greater than or equal to 10 g/hour;
- 20 mg/Nm3 for discharges of halogenated VOCs with a mass flow equal or greater than 100 g/hour;
- 50 mg/Nm3 for waste gases from drying for large installations (solvent consumption >15 t/a);
- 75 mg/Nm³ for coating application processes for large installations (solvent consumption >15 t/a);
- - 100mg/Nm³ for small installations (solvent consumption <15 t/a).
- If solvent is recovered from emissions and reused, the limit value is 150mg/Nm³

Source: IFC-EHS Guidelines „Textile Manufacturing"

„Environmental protection and the rational use of energy have a high value for the German textile and clothing industry. The central task here is to establish production processes in an ecologically and economically responsible manner on the basis of statutory requirements, i.e. to use resources efficiently."

Christina Meßner, Gesamtverband der deutschen Textil- und Modeindustrie e. V.



Benchmarks in textile production

WASTE WATER AND WASTE QUANTITIES

ORIGIN OF WASTE WATER	BENCHMARK
Wool scouring	2–6 l/kg textile substrate
Yarn finishing (wool)	35–45 l/kg textile substrate
Yarn finishing (cotton)	100–120 l/kg textile substrate
Yarn finishing (synthetic fibres)	65–85 l/kg textile substrate
Finishing of knitted fabrics (wool)	60–70 l/kg textile substrate
Finishing of knitted fabrics (cotton)	60–135 l/kg textile substrate
Finishing of knitted fabrics (synthetic fibres)	35–80 l/kg textile substrate
Finishing of woven fabric (wool)	70–140 l/kg textile substrate
Finishing of woven fabric (cotton)	50–70 l/kg textile substrate
Finishing, including printing, of woven fabric (wool)	150–80 l/kg textile substrate
Finishing of woven fabric (synthetic fibres)	100–180 l/kg textile substrate
Sludge from waste water treatment	1–5 kg/m^3

Source: FC-EHS Guidelines „Textile Manufacturing“

WASTE WATER EMISSIONS AT THE POINT OF DISCHARGE

PARAMETER	EMISSION VALUE
pH value	6–9
BOD_5	30 mg/l
COD	160 mg/l
AOX	1 mg/l
Suspended solids	50 mg/l
Oil and grease	10 mg/l
Pesticides	0,05–0,10 mg/l[a)]
Cadmium	0,02 mg/l
Chromium, total	0,5 mg/l
Chrom VI	0,1 mg/l
Cobalt	0,5 mg/l
Copper	0,5 mg/l
Nickel	0,5 mg/l
Zinc	2 mg/l
Phenol	0,5 mg/l
Sulphide	1 mg/l
Phosphorous, total	2 mg/l
Ammonium- nitrogen	10 mg/l
Total nitrogen	10 mg/l
Colour	7 m^{-1} (436 nm, Gelb) 5 m^{-1} (525 nm, Rot) 3 m^{-1} (620 nm, Blau)
Toxicity to fish eggs	2
Temperature increase	<3 °C

a) 0.05 mg/l for total pesticides (organophosphorous pesticides excluded); 0.10 mg/l for organophosphorous pesticides.

Source: IFC-EHS Guidelines „Textile Manufacturing“

Benchmarks in leather productionn

CONSUMPTION OF RESOURCES AND ENERGY

CONSUMPTION PER UNIT PRODUCED	BENCHMARK
Energy/fuel	9.3–42 GJ/t raw hide
Chemicals	~500 kg/t raw hide
Water consumption	12–30 m^3/t raw hide (salted bovine hide)
	32–69 m^3/t raw hide (pig skin)
	110–265 l/Fell (salted sheepskin)
	360 l/Fell (wool-on sheepskin)

Source: IFC-EHS Guidelines „Tanning and Leather Finishing", adaptiert durch das Umweltbundesamt

VOC EMISSIONS FROM LEATHER COATING

THRESHOLD VALUE FOR SOLVENT CONSUMPTION	EMISSIONS VALUE
10–25 t/a	85 g VOC/m^2
>25 t/a	75 g VOC/m^2
>10 t/a	150 g VOC/m^2 a)

a) For leather coating in furniture manufacture and particular leather goods used as small consumer goods, such as bags, belts, wallets etc.

Source: Directive 2010/75/EU

VOC EMISSIONS FROM SHOE PRODUCTION

THRESHOLD VALUE FOR SOLVENT CONSUMPTION	EMISSION VALUE
<5 t/a	25 g VOC per pair

Source: Directive 2010/75/EU

WASTE WATER EMISSIONS AT THE POINT OF DISCHARGE

PARAMETER	EMISSIONS VALUE
pH value	6–9
BOD_5	50 mg/l
COD	250 mg/l
Suspended solids	50 mg/l
Sulphide in partial flow containing sulphides a)	2 mg/l
Chromium VI	0,1 mg/l
Chromium, total in partial flow containing chromium b)	1 mg/l
Sulphate c)	300 mg/l
Ammonium-nitrogen d)	10 mg/l
Total Kjeldahl Nitrogen d)	10 mg/l
Phosphorous, total	2 mg/l
Phenol	0,5 mg/l

a) Waste water from soaking, liming and deliming, each including rinsing
b) Waste water from tanning, including dewatering and from wet finishing, each including rinsing
c) for areas where the sewer system don't tolerate sulphate
d) for nitrification a water temperature of at least 12 °C is necessary

Source: IFC-EHS Guidelines „Tanning and Leather Finishing", adapted by the Federal Environment Agency

ENVIRONMENTAL MANAGEMENT: THE FIRST STEPS AND THE EFFECTS THEY HAVE

Environmental management is not limited to textile and shoe production, it is also one of the best available techniques for all industrial branches. Therefore, in this guideline it sets the initial impulse as far as your operational environmental protection is concerned.

Strategic environmental management starts with the analysis of operational material and energy flows. This enables you to recognise exactly where you can optimise. In the process, options for organisational improvement or unproductive costs incurred also become evident. Dispensing with these can significantly increase the cost efficiency and quality of your products. Thanks to your transparent documentation of the quantity and environmental relevance of substances employed and disposed of the trust of your customers and partners in you as a supplier will grow.

The tasks of environmental management concern such key corporate fields as:

- Analysis of the input and output mass flows in your production.
- Well-documented procedures for the maintenance of your plant and the storage, dosage and preparation of the chemicals employed.
- Education/Training of your employees.

„There are numerous ways of integrating employees into ecological processes optimally. Training and E-learning offer a simple and efficient way for us to implement environmental protection within our company."

Mareke Wieben, IKEA Deutschland GmbH & Co. KG

- A functioning information and communication structure throughout the length of your value chain.

The processes in the textiles industry are highly complex. The BREFs therefore advises you to work closely with your suppliers. Do not only strive to achieve this at your site, also implement it step-by-step for the co-operation with production partners beyond the region. In this way you will establish a chain of environmental responsibility that will be increasingly decisive for your marketing success.

Recognition and controlling of input and output mass flows

All of the environmental effects of a company can be connected directly to mass flows. The better you recognise the quality and quantity of these flows, the earlier you can control these. These mass flows comprise the input of textile raw material, chemicals, energy and water on the one hand and the output of products, waste water, waste air, sludge, waste and by-products on the other.

The simplest way to begin is by drawing up an overview of the input and output mass flows per production site and year. Following this, a more precise analysis of individual production stages can be undertaken.

Documentation and monitoring

Document how your company fulfils the requirements of operational environmental management. In an information system suitable for documentation your environmental management staff can effectively record and present the orderly operation, observance of statutory requirements and the environmental objectives already achieved. This is particularly important in communication with business partners, authorities, employees and the public. For example, in this way it is also possible to provide seamless records of all relevant data and measures in the event of liability cases.

Embarking on environmental management in your own company is one thing – regularly checking the environmental management yourself is another. These audits should cover all environmentally-relevant procedures. Appoint a responsible audit manager for this.

Many companies, for example, have their environmental management system audited and certified by external auditors. Such a certificate is an external indication that your company applies the right tools and measures for operational environmental protection.

Training employees is active environmental protection

To ensure that your environmental management approach and your subsequently improved production processes bear fruit you should pay attention to the thorough training and further education of your staff. They should all understand and remember their tasks in the field of operational environmental protection. Regular training sessions for your staff are especially effective – for example in the use of chemicals, the risks associated with incorrect storage, handling in production and the protection of employees against hazardous substances. Further training themes could be, for example, the use of the machinery, the right approach in separating and collecting waste or energy saving measures.

THE JOB OF YOUR ENVIRONMENTAL MANAGER: ANALYSIS, ACTION, MONITORING

For the integration of environmental innovations in your company to be successful, someone must take responsibility for this. Appoint a staff member for environmental management, with responsibility for co-ordinating this field and acting as a contact for all environmentally-relevant matters.

Depending on the size of your company, this task can also be undertaken by an environmental team. This represents the key departments of your company, such as research and development, production, purchasing, sales, marketing and communication.

What your environmental management staff should pay attention to:

- Recognition and prioritising of acute environmental risks in the company, so that these may be addressed quickly. This also includes obtaining support from specialists and environmental partners on site.

- Precise description of process stages with increased potential for environmental risk at your company. Precisely-defined procedures are an important basis for environmental management system measures with regard to environmental protection issues.

- Integration of the measures described in this guideline into your corporate processes in a manner that ensures that no inefficient isolated solutions arise.entstehen.

As a company, you should have a vision that incorporates the environmental thinking. The goals of environmental management should also be anchored in your corporate strategy. A consistent top-down approach is advisable, for example, one that prescribes environmental management issues as fixed agenda items in meetings in which these are relevant.

The setting of objectives should be an integrative approach in which environmental protection runs right through the company and is not merely limited to the specialist environment department. The management level of your company should assume an exemplary role in this.

GOOD PRACTICE EXAMPLE

E-learning, an example of effective employee training

Employee training is particularly effective when the objective is to communicate corporate policy goals and tasks to employees. Training such as this could take the form of a conference or course.

The IKEA company uses the E-learning approach for this in a variant that is especially effective to grasp: the participants attend a virtual learning house on their own PC. The screen moves from one room to the next. In every room the user finds new learning themes. The range of material is extensive: information texts, short films or puzzles ensure a varied and attractive learning experience. The programme can also be implemented as trainer-led training and is compulsory for all employees.

The objective of this IKEA learning programme: to communicate to all employees what IKEA means by the term sustainability and how the company aims to fulfil its responsibilities to man and nature. In this the participants learn how they can make their own everyday situations more sustainable.

In addition to energy saving measures, the separation of recyclable resources and reduction of CO2 the learning programme also addresses social projects and the IKEA Code of Conduct (IWAY). This means that the E-learners not only learn about the sustainability milestones that IKEA has already passed, they also learn about the tasks that need to be resolved in the future, and that each individual IKEA employee is required for this.

OPERATIONAL IMMEDIATELY: BAT FOR „GOOD HOUSEKEEPING“

Perhaps taking account of environmental aspects at your company appears difficult to you at first glance. You may be fearful of a costly restructuring of your corporate processes. And yet switching to environmentally-friendly production is often very simple. Many of the suggestions on the next pages can be implemented without any significant effort with regard to human resources. A number of the techniques also incur no high costs. On the contrary: you save money if you use fewer resources, energy and water.

The measures recommended here for your resource-efficient production on the basis of BATs are colour coded: fundamental measures within the process steps are listed first. The measures are labelled according to their positive effect on the following environmental areas: water demand/waste water burden, energy demand, use of resources, waste volumes and air pollution. To facilitate the location of the techniques in the BREF the respective BREF chapters are stated.

„The regular inspection of filter units avoids unnecessary downtime and guarantees lower emission values in production.“

Frank Henke, adidas Group

AREA OF APPLICATION	BAT	WATER	ENERGY	RESOURCE	WASTE	AIR
Education/ training of employees	Employees learn preventive environmental and work safety measures, as well as measures for saving resources at the company. The training should be tailored to the resources (chemicals, raw materials, energy, water), processes and the equipment/machinery.	●	●	●	●	●
Equipment maintenance and operations audit	Maintain machinery, pumps and piping thoroughly and check for leaks. It is not only the water system that should be considered here, but also systems for heat carrier liquids and chemicals dispensing systems. Draw up maintenance plans that foresee regular maintenance and document all work activities.	●	●	●	◔	◔
	Include the most important components of the machinery such as pumps, valves, level setters, pressure and flow controls in the maintenance plan.	●	●	●	◔	◔
	Check and clean filters regularly.					●

Key:

- High environmental benefit/high savings potential
- Environmental benefit/savings potential
- Fundamental measure
- Further measure

Water = Water demand/waste water pollution
Energy = Energy demand
Resource = Use of resources
Waste = Waste volume
Air = Air pollution

TXT = BREF „Textile industry“
TAN = BREF „Tanning of hides and skins“

AREA OF APPLICATION	BAT	WATER	ENERGY	RESOURCE	WASTE	AIR
Equipment maintenance and operations audit	Calibrate measuring devices, for example measuring and dosage systems for chemicals and thermometers.			●		
	Clean and maintain thermal treatment equipment (such as stenters) at regular intervals (at least once a year). Remove residue from the waste air channels and deposits from the burner air intake pipes.		●			●
Storage and handling of chemicals	Store all chemicals in accordance with instructions (as stated in the safety data sheet of the manufacturer).	●		●	●	●
	Ensure that all safety data sheets for all chemicals used and stored are available, up-to-date and easily accessible.	●				●
	Check the leak tightness of all areas in which chemicals are stored or where a leak is likely, so that leaking chemicals cannot enter the groundwater or the sewer. Keep storage areas well ventilated, in particular where halogenated and halogen-free organic solvents or waste containing these substances are stored.	●		●	●	
	Take preventive technical measures for the safety and protection of individuals: ↗ Keep first-aid facilities on hand, ↗ Conduct regular drills of evacuation and emergency situations on site, ↗ Document accidents and incidents.					
	Regularly inspect pumps and piping systems used for chemicals for leaks.	●		●		
	In the case of manual work take precautions for the safe handling of chemicals (including regular employee training).	●		●		●
	To avoid loss in manual handling weigh, dose and mix chemicals carefully.			●		
	AuUse automatic preparation and dispensing equipment. (TXT 4.1.3)	●		●	●	
		up to **30 %** lower costs				
Improved knowledge of the raw materials and chemicals used	Monitor the input and output flows of the individual processes continuously. Determine the input and output mass flows for both the site as a whole and each individual production process. Implement a product input check that takes account of raw materials, chemicals, dyes and auxiliary materials etc.	●	●	●	●	●

AREA OF APPLICATION	BAT	WATER	ENERGY	RESOURCE	WASTE	AIR
Minimisation/ optimisation of the chemical input	Refrain from using chemicals in processes in which the desired process result can also be achieved without the use of chemicals.					
	Check recipes regularly in order to identify and avoid superfluous chemical volumes.					
	Employ chemicals and auxiliary materials with good biodegradability/bioeliminability, low human and eco toxicity, low volatility and odour intensity.					
	Employ improved measurement and control equipment, for example for temperature, chemical addition, retention time, moisture (in dryers).					
	Apply minimum application procedures.					
	Avoid/minimise all superfluous chemicals and auxiliary materials (e.g. through automatic dosing points for chemicals).					
	Optimise process sequences in production. For example, water and chemicals for machine cleaning can be reduced where dark dyeing follows light dyeing.					
	Use vapour recovery systems (vapour return) when filling volatile compounds.					
	Re-use process liquors.					
	Pay attention to high fresh water quality to avoid / reduce the use of chemicals to treat process water.					
Use of water and energy	Describe production processes in a detailed and comprehensible way, so that resources are not wasted through unsuitable work processes.					
	Monitor consumption of water and energy.					
	Employ efficient washing processes, for example: ↗ Replacement of overflow rinsing with interval rinsing, ↗ counter current principle. (TXT 4.9.1, TXT 4.9.2, TAN 4.6.1.2)					

50 – 75 % less water consumption

AREA OF APPLICATION	BAT	WATER	ENERGY	RESOURCE	WASTE	AIR
Use of water and energy	Apply thermal insulation to pipes, valves, containers and machinery. (TXT 4.1.5, TXT Kap. 4.8.1)		Savings potential for total energy consumption up to 9 % with aqueous processes. Increased insulation on the stenters alone from 120 mm to 150 mm saves 20 percent of energy			
	Optimise process sequences in production.					
	Combination of different aqueous procedures in one single-stage process step (e.g. combined scouring and desizing, combined scouring/ desizing and bleaching). (TXT 4.5.3)					
	Reuse water, for example: ↗ Reuse the last rinsing baths , ↗ reuse dye baths, ↗ use the water from the pre-wash for the re-washing (carpet finishing), ↗ use counter current for continuous wash, ↗ use cooling water as process water. (TXT 4.6.22, TXT 4.1.1, TXT 4.5.8, TAN 4.6.1.5)		Reduces specific water consumption from 60 to 25 l/kg			
	Use machines with low liquor ratio (short bath). Use airflow-jet dyeing machines instead of conventional jet dyeing. Modern tanning tanks save water. (TXT 4.1.4, TAN 4.6.1.3, TAN 4.6.1.4)		Savings potential for water, chemicals and heating energy of up to 50 %			
	Use low add-on application techniques.					
	For batch processes: install automatic controls that enable the precise setting of filling volumes and bath temperature. (TXT 4.6.19)					
	For continuous processes: install flow control devices and automatic stop valves that combine the water flow with the main propulsion of the machine. (TXT 4.9.2)					
	Closed design of machines to reduce vapour loss. (TXT 4.1.1, TXT 4.6.19)					
	Separate the hot and cold waste water streams before the heat exchanger and recover the heat in hot stream.					

AREA OF APPLICATION	BAT	WATER	ENERGY	RESOURCE	WASTE	AIR
Use of water and energy	Install exhaust air - heat recovery systems.		Energy saving potential up to 70%			
	Optimise the boiler house: ↗ Condensate recovery, ↗ Pre-heating of air intake, ↗ Heat recovery from combustion waste gases.					
	Install frequency-controlled electric motors. Use electrical motors with efficiency class I in this.					
Waste and waste water management	Treat waste water within the company or externally					
	Channel highly-polluted and mildly-polluted waste water flows separately in order to achieve improved cleaning efficiency.					
	Collect unavoidable solid waste separately.					
	Prevent the pollution of waste with hazardous waste via strict separation of waste.					
	Save material in packaging.					
	Use returnable containers.					
	Organise processes in a way that avoids waste or at least reduces the volume of waste.					
	Recycle waste.					
Exhaust air treatment	Exhaust air treatment for emissions-relevant processes.					

Key:

- High environmental benefit/high savings potential
- Environmental benefit/savings potential
- Fundamental measure
- Further measure

Water= Water demand/waste water pollution
Energy = Energy demand
Ressource = Ressourceneinsatz
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TXT = BREF „Textile industry"
TAN = BREF „Tanning of hides and skins

PRODUCTION-INTEGRATED BATS IN THE TEXTILE INDUSTRY

Where good housekeeping concerns measures that are applied to and affect all areas of production, the integrated BATs are part of specialised production processes. Integrated technologies are employed in the input of raw materials, pre-treatment, in dyeing, printing and finishing.

„In the textile value chain the efficient use of water and energy can often be enabled through inexpensive measures. The interaction with partners on suitable measures sets initial impulses, with implementation allowing both ecological and economic benefits to be achieved."

Torben Kehne, Systain Consulting GmbH

Supplementary end-of-pipe measures affect waste management as well as the treatment of waste water and exhaust air and are covered in a chapter of their own (p 39).

Unless otherwise noted, all details refer to the BREF "Textile industry" and subsequently the processes of textile finishing. This guideline only presents selected measures from this document. More precise details of all best available techniques, including those not named here, can be found in the document itself, down to the detailed technical level.

Ecologically-relevant developments such as the use of organic cotton or recycled chemical fibres are omitted from this guideline. Similarly, the content of the REACH Directive (Registration, Evaluation, Authorisation and Restriction of Chemicals) regarding the use of chemicals is not covered in detail here. In the appendix you will find sources for further information on these themes.

BATS FOR RAW MATERIAL INPUT

PROCESS	BAT*	WATER	ENERGY	RESOURCE	WASTE	AIR
Use of chemicals	Use of surfactants, complexing agents and anti-foaming agents that are biodegradable or bioeliminable in waste water treatment. (4.3.3 – 4.3.5)					
	Use of substances with low human and eco toxicity (replacement of substances with very high concern according to the REACH Directive (CMR substances, PBT substances and substances with comparable potential as per article 57a-f of the REACH Directive)).					

*) text references refer to the BREF „Textile industry"

Key:

 High environmental benefit/high savings potential

 Environmental benefit/savings potential

Fundamental measure

Further measure

Water = demand/waste water pollution

Energy = Energy demand

Resource = Use of resources

Waste = Waste volume

Air = Air pollution

BATS FOR PRE-TREATMENT

PROCESS	BAT*	WATER	ENERGY	RESOURCE	WASTE	AIR
Desizing	Selection of raw material with size that is biodegradable or bioeliminable. (4.2.4)	●	●	●		
	Selection of raw material with minimised size application (via pre-wetting prior to sizing). (4.2.5)	●		●		
	Combination of desizing, washing and bleaching in one process stage. (4.5.3)	●	●			
	Rückgewinnung und Wiederverwendung von wasserlöslichen synthetischen Schlichtemitteln durch Ultrafiltration. (4.5.1)	●		●		
Bleaching	Use of hydrogen peroxide instead of chlorine-based bleaches. (4.5.5, 4.5.6)	●				
Mercerising	Recovery and reuse of caustic soda solution from the mercerising process. (4.5.7)	●		●		

Recovery rates for size **80% - 85 %**

*) All text references refer to the BREF „Textile industry

BATS FOR DYEING

PROCESS	BAT*	WATER	ENERGY	RESOURCE	WASTE	AIR
General BATs for dyeing	Reduction in the number of dyes used.					
	Use of automatic dosage and conveying systems for dyes (manual mixing for dyes seldom used). (4.1.3)					
	In the case of long, continuous conveyor distances (dead volume of the conveyor system comparable to the volume of the dyeing foulard): use of decentralised, automatic dyeing points that do not pre-mix the different chemicals with the dyes prior to the dyeing process.					
General BATs for batch dyeing	Use of dyeing machines with ↗ automatic controls for filling volume, temperature and other relevant parameters, ↗ indirectly heated heating and cooling systems ↗ hoods and doors to minimise vapour loss in enclosed dyeing machines. (4.6.19–4.6.21)					
	Use of suitably-dimensioned dyeing machines.					
General BATs for continuous dyeing processes	Use of adding systems with low bath volumes. Minimisation of the dipping trough volume (with the use of the pad dyeing technique).					
	Improved washing efficiency via the counter current principle. Reduction in carry-over (e.g. through squeegees). (4.9.2)					
Polyester and polyester blends dyed with disperse dyes	Use of polyester fibres that can be dyed without carriers: 1st priority. (4.6.2)					
	Dyeing under high temperature conditions without the use of carriers: 2nd priority.					
	Replacement of conventional carriers with compounds based on benzyl benzoate and N-alkylphthalimide: 3rd Priority.					
Batch dyeing with reactive dyes	Exhaustion dyeing of cellulose fibres with low salt reactive dyes. (4.6.11)					

The optimisation of machine equipment for winch beck dyeing machines saves up to **50%** of fresh water and up to **30%** of energy in the total dyeing process..

The use of a U-trough reduces the bath residue by **60–90 %**

Lowers neutral salt consumption by a third. Important in arid climate zones with negative water balance.

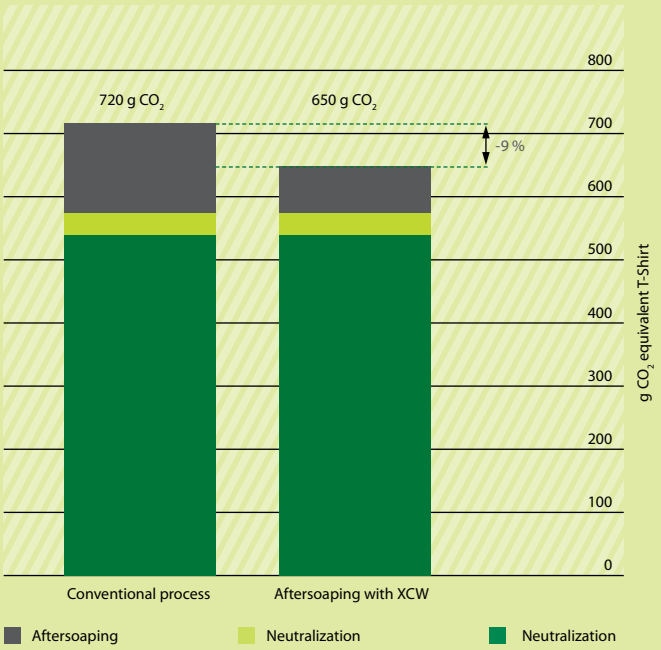
*) All text references refer to the BREF „Textile industry

GOOD PRACTICE EXAMPLE

REDUCED CO2 EMISSIONS THANKS TO OPTIMISED USE OF CHEMICALS

In 2009 the Viyellatex Group, a textile supplier from Bangladesh, integrated a new type of chemical into its dyeing process which reduces CO2 emissions in production and brings with it no additional disadvantageous environmental properties. Thanks to the use of this new chemical the multiple soaping processes normally required have been replaced with a single one. The dyeing results were excellent and the ecological parameters improved considerably: energy consumption was reduced by 9 percent, the use of water by 12 percent. In addition, dyeing time was l owered from 80 to 70 minutes, in the process raising the number of dyeable batches per day from 18 to 20.

COMPARISON OF THE CO2 BALANCE OF CONVENTIONAL AND ALTERNATIVE DYEING PROCESSES



Thanks to the optimised use of chemicals in the field of subsequent soaping CO2 consumption was reduced by 9 percent. This has also had a positive financial effect for the Viyellatex Group.

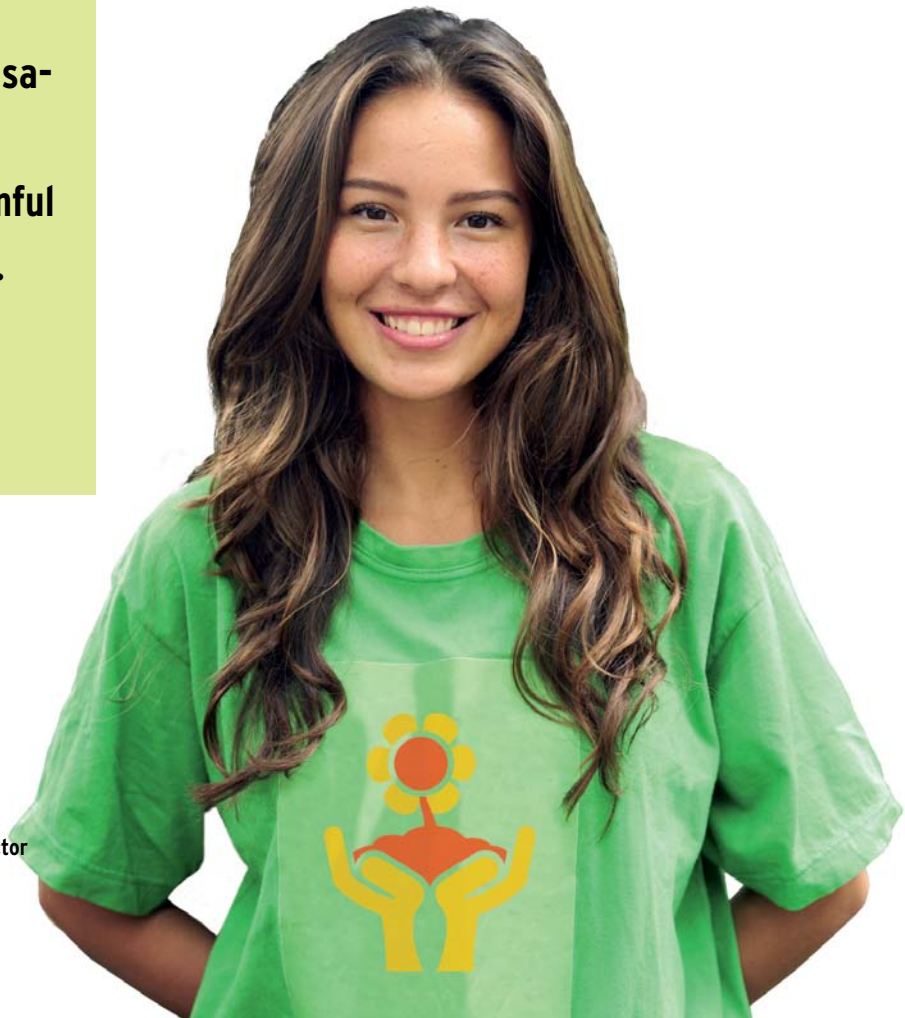
BATS FOR PRINTING

PROCESS	BAT*	WATER	ENERGY	RESOURCE	WASTE	AIR
General	Recycling of residual printing paste. (4.7.6)			Achievable recycling rates of between 50 and 75 %		
	Reduction in water consumption for washing processes: ↗ Start/stop control for the cleaning of the printing belt ↗ of the cleanest portion of the rinsing water from the cleaning of the squeezers and screens, ↗ of the rinsing water from the cleaning of the printing belt . (4.7.7)	Lowers water consumption by up to 55 %				
Reactive printing	Substitution or reduction of urea volumes: Single-stage process with controlled humidifying. (4.7.1)					
Pigment printing	Use of optimised, low-emission printing pastes: ↗ Low-emission thickener, ↗ APEO-free and with a high degree of bioeliminability, ↗ reduced ammonia content. (4.7.3)					

*) All text references refer to the BREF „Textile industry

„When using chemicals it is advisable to use substances that have the lowest environmentally harmful and human toxicological effects.

Stefanie Santila Karl, Hess Natur-Textilien GmbH



BATS FOR FINISHING

PROCESS	BAT*	WATER	ENERGY	RESOURCE	WASTE	AIR
Allgemeines	Use of low add-on application techniques or reduction volume of padding devices..					
	Replacement of halogen organic solvents (e.g. in stain removal and subsequent cleaning)..					
	Use of recipes optimised with regard to lower emissions in air and waste water. (4.3.1, 4.3.2)					
	Minimisation of energy consumption at the stenters:					
	↗ Use of mechanical dehydration to reduce moisture content of the textile to be dried	Energy saving of up to **15%**				
	↗ optimisation of air flow at the stenters,	Energy saving of up to **57%**				
	↗ installation of heat recovery systems,	Energy saving of up to **70%**				
	↗ insulation of thermal treatment units,,	Energy saving of up to **20%**				
	↗ regular maintenance of the burners in the case of directly-heated thermal treatment units. (4.8.1)					

BATS FOR WASHING PROCESSES

PROCESS	BAT*	WATER	ENERGY	RESOURCE	WASTE	AIR
Washing	Replacement of overflow washing with drainage/inflow methods or „intelligent" rinsing techniques. (4.9.1)	 Lowers water consumption by up to **50–75 %**				
	Installation of washing machines with improved functions ↗ Through-flow measurement, ↗ improved washing efficiency through applied counter-current principle with water recycling,, ↗ Use of heat exchangers. (4.9.2)					

*) All text references refer to the BREF „Textile industry"

GOOD PRACTICE EXAMPLE

MORE PROFIT THROUGH RECYCLING

In the production of textile goods waste is an unavoidable consequence. The Indian textile manufacturer Alok Industries Limited recycles over 10 tonnes of polyester fibre and even PET bottles per day to make recycled fibre. Similarly, the company also recycles its complete synthetic waste. From this it obtains new material for bags, packaging and sheeting. Waste generated in the course of spinning, weaving and knitting of cotton is used as raw material in the production of yarn.

In addition to the introduction of comprehensive recycling measures, Alok Industries has also turned to environmentally-friendly production processes: the Indian textile producer has implemented strict waste water controls during the dyeing process. Large quantities of the waste water consumed are recycled using osmosis filters.

ENVIRONMENTALLY-FRIENDLY TECHNIQUES IN THE MAKING-UP OF TEXTILES

Making-up of textiles describes the process of manufacturing clothing. The process chain from the textile surface to the finished product comprises:

- Cutting/separating.
- Joining (sewing, welding, gluing).
- Shaping.
- Finishing.
- Packing.

Of particular environmental relevance here is energy consumption, chemical use and the associated air emissions as well as waste generated.

Energy

New energy-saving machines for ironing or pressing can significantly lower your energy consumption. The high-frequency fixing technology of modern presses only affects the adhesive, much in the manner of a microwave. As a consequence, a working temperature of just around 120 °C is required, which is not only gentle on the textile but also lowers your energy costs.
Further measures for environmentally-friendly tailoring can be found in the chapter „Operational immediately: good housekeeping suggestions“ (p 19).

Chemicals

In the tailoring process formaldehyde is often used in the sewing and ironing stages, with halogenated and non-halogenated solvents used in stain removal.

Formaldehyde is carcinogenic and can lead to allergic reactions. The maximum allowable workplace concentration (MAC) may not exceed 0.5 ml/m3 (ppm) or 0.6 mg/m3. You can strongly reduce or even avoid formaldehyde emissions by using formaldehyde-free or low-formaldehyde curing agents in your processes.

Waste

The best waste is waste you avoid. For example, when cutting out the textiles make sure that the pieces are arranged optimally via so-called nesting. Specialised nesting software can be employed to perform this automatically - for example on CNC cutting machines.

Unavoidable waste is best collected separately, so that it can be recycled.

„The BREFs support companies in the continuous implementation of environmental standards in operational practice.“

Andreas Tepest, Deichmann SE

„All production is associated with environmental effects. The consumer expects these to be minimised, for example by using the BAT and where possible avoiding chemicals with properties that are hazardous to health and the environment.“

Heribert Wefers, Bund für Umwelt und Naturschutz Deutschland e. V.

GOOD PRACTICE EXAMPLE

FINANCIAL SUCCESS WITH RE-GENERATIVE ENERGIES

The Diamond Group of China is a shoe producer of the sports lifestyle company PUMA. In 2009 the company published a sustainability report for the first time in its 38-year history. The report was drawn up in the scope of a joint training project that the Global Reporting Initiative conducts in collaboration with PUMA. In its sustainability report Diamond describes how, amongst other aspects, the installation of solar units and water filtration units made it possible to save energy and money.

To save costs and generate environmentally-friendly energy the Chinese shoe producer installed solar collectors on the roof of its factory.

These reduce the amount of electricity that the company purchases per day by 71.5 kWh and 2,145 kWh per month. These savings in operating costs have enabled the company to save over 240 euros per month, or 2,900 euros per year.

In addition, the Diamond Group also installed a facility to recycle waste water, which recycles 80 percent of daily requirements in total. Prior to the use of the unit, fresh water requirements stood at 486 cubic metres per day. Following the installation, 389 cubic metres a day can be reused. The new unit will result in the recycling of over 141,985 cubic metres of water per year. The reduction in fresh water consumption means that the company saves 41,491 euros per year.

PRODUCTION-INTEGRATED BATS IN LEATHER PRODUCTION

As is the case for textile production, numerous environmentally-friendly techniques have proved their worth in leather production. All text references refer to the BREF "Tanning of hides and skins" - with the exception of the details regarding shoe manufacturing (p 36). In this field Prüf- und Forschungsinstitut Pirmasens e. V. has been implementing a number of research projects since 2003 addressing VOC reduction in shoe production and has drawn up a basis for implementation into practice addressed in this brochure.

This guideline only presents selected measures from the leather industry BREF. More precise details of all best available techniques, including those not named here, can be found in the document, down to the detailed technical level.

Integrated technologies are employed for example in the beamhouse, in tanning and when finishing the leather. End-of-pipe measures affect waste management as well as the treatment of waste water and exhaust air and are covered in a chapter of their own (p 39).

BATS FOR USE OF CHEMICALS

PROCESS	BAT*	WATER	ENERGY	RESOURCE	WASTE	AIR
Use of chemicals	Selection of complexing agents and surfactants that are or capable of bio degradation or bio elimination. (4.1.1, 4.1.6)	●				
	Organic halogen compounds: these can be completely replaced in nearly all cases. This includes substitutes for soaking, degreasing, fat liquors, dyes and special post- tanning agents. Exception: the cleaning of Merino sheepskins (4.1.4, 4.1.2.3)	◐				◐

*) Alle Textverweise beziehen sich auf das BVT-Merkblatt „Lederindustrie"

Key:

- ● High environmental benefit/high savings potential
- ◐ Environmental benefit/savings potential
- Fundamental measure
- Further measure

Water= Water demand/waste water pollution
Energy = Energy demand
Ressource = Ressourceneinsatz
Waste = Waste volume
Air = Air pollution

BATS FOR THE BEAMHOUSE

PROCESS	BAT*	WATER	ENERGY	RESOURCE	WASTE	AIR
curing and soaking	Processing of fresh hides, where available. (4.2.1)					
	Reduce the amount of salt used as far as possible.					
liming and unhairing	Reduction in sulphide consumption via the use of enzyme preparations (not for sheepskins). (4.2.3.2)					
	Use of hair - savetechnology.					
Splitting	Use of as much of the split as possible.					
Deliming and bating	Partial substitution of ammonium salts with CO2 and/or weak organic acids. (4.3.1)					

Lowers COD and sulphide content by each **40–70 %**

Reduces the sludge volumes in waste water treatment by **15–30%**, the COD content of waste water by **30–65%** and BOD content by **60%**

Lowers overall nitrogen by **20–30%**. In CO2 deliming the BOD is lowered by **30–50%**

BATS FOR TANNING

PROCESS	BAT*	WATER	ENERGY	RESOURCE	WASTE	AIR
Pickling	Use of a short floats (50-60 percent float, related to the fleshed weight). (4.3.2.1)					
	Recycling of pickling baths or reuse of pickling bath in the tanning process. (4.3.2.2)					
Tanning	Increasing efficiency of chromium tanning via careful control of the pH value, the float, the temperature, the time, the chromium supply and the drum speed. (4.3.4.1)					
	Chromium recovery. (4.3.4.4)					
	Use of high-exhausting tanning methods where chromium recovery is not possible. (4.3.4.2)					

Lowers specific water consumption by up to **50 %**

Reduces chromium content in waste water by **50–80 %**

Saves up to **35%** of fresh chrome tanning salt. Chromium emissions are lowered dramatically.

*) All text references refer to the BREF „Tanning of hides and skins“

BATS FOR FINISHING

PROCESS	BAT*	WATER	ENERGY	RESOURCE	WASTE	AIR
Retanning, chromium fixation and neutralisation	Improving the exhaustion of retanning agents and the fixation of tanning agents in leather. (4.4.1)	●		●		
Dyeing	Selection of dyes with low environmental impact: ↗ Dust-free or liquid dyes, ↗ dyes with high exhaustion and low salt content, ↗ replacement of dyes containing halogen. (4.4.2)	●				●
Fat liquors	Improving the exhaustion of fat liquors. (4.4.3)	●		●		
	Selection of fat liquors with low environmental impact: Free from substances that form AOX. Exception: waterproof leather (4.1.2)	●				
Drying	Optimisation of mechanical dewatering prior to drying. (4.4.4)		●			
	Insulation of the plant and reduction of heat loss.		●			
Application of a surface coat	Selection of finishing agents for top coats, binders (resins) and crosslinking agents with low environmental impact. Cadmium and lead-free pigments and finishing systems. (4.1.3, 4.4.2.3)	●				●

*) All text references refer to the BREF „Tanning of hides and skins“

ENVIRONMENTALLY-FRIENDLY TECHNIQUES IN SHOE PRODUCTION

The manufacture of shoes extends far beyond the production of leather. Use the following impulses of Prüf- und Forschungsinstitut Pirmasens e. V. (PFI) for process technology improvements, including in upper production, shoe construction or concluding surface treatment

„The BREFs are the best way to offer the customers the ecological products that they frequently demand."

Monika Büning, Verbraucherzentrale Bundesverband e. V.

„Health-endangering VOC emissions in textile and shoe production need to be reduced. Whether this is through good housekeeping measures or altered production processes – the techniques for this are known and well documented with BATs."

Yvonne Kochs, C&A Mode GmbH& Co. KG

The production of shoe uppers now increasingly involves the use of dispersion adhesives and hot melts. These serve as assembly aids to avoid slippage during stitching. Soles of city shoes can be glued as standard using dispersions. Hot melts are employed for lasting machines and the sealing of membranes.

Upper manufacturing
- ↗ Reduce VOC emissions by using solvent-free pressure systems

Shoe assembly
- ↗ Reduce VOC emissions by using hot melt adhesives or water-based adhesives
- ↗ Direct injection of soles or sole components using thermo-plastic elastomers

Surface treatment
- ↗ Use of water-based finish (polishes, creams, waxes, dressings, varnishes) or finish with reduced VOC content

Halogenation
- ↗ Use of VOC-free halogenating substances
- ↗ Plasma treatment
- ↗ UV treatment

GOOD PRACTICE EXAMPLE

CONSIDERABLE REDUCTION OF VOC EMISSIONS WITH DISPERSION ADHESIVES

The alpine shoe producer Hanwag has managed to lower VOC emissions by up to 40%. To achieve this, Hanwag used dispersion adhesives in the gluing of bindings and employed pre-coated materials.

Solvent-free adhesives can also be considered in the manufacture of shoes for extreme conditions. The research project „Production techniques for the reduction of adhesive use in heavy shoe production", completed in collaboration with the German fire service boot manufacturer Haix and suppliers, shows that solvent-free adhesive systems also prove their effectiveness in resisting heat of 250°C for 20 minutes.

GOOD PRACTICE EXAMPLE

PRE-SIZED GOODS REDUCE WASTE, EMISSIONS AND WORK INPUT

Panel goods for soles cause stamping waste and emissions through subsequent processing stages, such as halogenating or adhesive application. In the case of shell soles, stamping waste is not incurred. Thanks to direct moulding only minimal volumes of waste are created. Here safety shoe manufacturers in particular have been able to reduce their solvent emissions from approximately 60 g/pair to approximately 15–20 g/pair – with the simultaneous rationalisation of work stages.

END OF PIPE: BATS FOR THE TREATMENT OF WASTE AIR AND WASTE WATER

Avoidance is also better and cheaper than cleaning when it comes to waste water and air emissions. Before installing waste water and exhaust air treatment equipment you should examine all practical ways in which you could avoid and reduce the volumes of waste water and the emissions of waste water and air at your company. This will enable you to save costs on waste water and exhaust air treatment.

WASTE WATER TREATMENT

The following general principles should be noted for waste water treatment:

- Characterisation of the different waste water flows in production.
- Separate waste water at the source with regard to impurity type and load before mixing it with other flows:
  - to enable internal recycling of mildly polluted partial flows,
  - to be able to treat heavily polluted partial flows in a targeted way or dispose of it as waste.
- The waste water flows should be submitted to the most suitable form of treatment.
- Do not send any waste water into the biological treatment facility that could cause malfunctions there.
- Employ alternative cleaning techniques for waste water with relevant volumes of non-biodegradable substances.
- If waste water with non-biodegradable compounds is not treated separately, then additional physical-chemical treatment of the waste water as a whole is required.
- Specific process residue (e.g. printing paste residue, padding liquor residue) should not enter the waste water but be disposed of in a more appropriate manner.

Treatment of waste water flows from the textile industry

- Biological treatment of the waste water in the activated sludge process, provided that the waste water partial flows that contain non-biodegradable substances are treated separately.
- Highly-polluted, selected, non-biodegradable waste water partial flows (e.g. desizing baths): chemical oxidation.
- Partial flows containing heavy metals: precipitation and flocculation.
- Heavily coloured waste water partial flows and waste water with a high volume of dissolved substances: membrane process.

Treatment of waste water flows from the leather industry

- Sulphide-containing waste water partial flows from the beamhouse:
  - Maintaining of a high pH value until sulphide treatment,
  - Sulphide treatment via oxidation with aerial oxygen or hydrogen peroxide and manganese salt as a cata lyst or biological oxidation.
- Chromium-containing waste water partial flows (e.g. from tanning and dewatering):
  Precipitation and flocculation or biological treatment..
- In the joint treatment of partial flows containing sulphide and chromium care should be taken to ensure that the same level of reduction of the pollutants is achieved as with the separate pre-treatment of the partial flows

TREATMENT OF EXHAUST AIR

Treatment of exhaust air from the textile industry

- Combination of condensation and scrubbing followed by electrostatic precipitation (ESP) or the use of thermal combustion with energy recovery in textile processes with relevant quantities of exhaust air emissions (e.g. thermosol processes, finishing, coating, printing).

„Our suppliers gain valuable production materials from the recycling of waste."

Torsten Stau, REWE Group

„In shoe production it is advisable to reduce air pollution by switching to alternative adhesives and installing an air filter. This makes a significant contribution to environmental protection and the effectiveness of the production process."

Dr. Kerstin Schulte, Prüf- und Forschungsinstitut Pirmasens e. V.

Treatment of exhaust air from the leather industry

- Treatment in wet scrubbers, for example to reduce ammonia and hydrogen sulphide emissions from the process stages of deliming, pickling and dyeing.
- Treatment in wet scrubbers, absorbers, biofilters, separation via low temperature condensation or combustion to reduce the release of volatile organic compounds from the process stages of degreasing, drying and finishing.
- Treatment in wet scrubbers, absorbers or biofilters to avoid the release of various substances from waste water treatment.

GOOD PRACTICE EXAMPLE

MODERNISATION PAYS OFF

Volatile organic compounds (VOC) are generated in the production of shoes. VOCs are carbonic substances that represent a burden for man and the environment. The Bulgarian shoe manufacturer Valeo noted that the production of its goods resulted in the release of over 60 tonnes of VOC per year. By incorporating modern filtration units, training staff and the precise observation and documentation of the entire production processes VOC emissions were reduced by 70 percent.

Die The extensive investments of the company paid for themselves quickly. Thanks to modern equipment, Valeo now saves around 50,000 euros a year on operating costs. In addition, thanks to regular training, most of the workforce is now able to respond rapidly to and resolve environmental problems that arise.

SOURCES

Bavarian State Ministry of the Environment and Public Health, The Environmentally-Aware Textile and Clothing Industry, 2000, in German

European Commission, BREF Tanning of hides and skins, February 2003
(www.bvt.umweltbundesamt.de/archiv-e/bvt_lederindustrie_vv.pdf)

European Commission, BREF Textile Industry, July 2003
(www.bvt.umweltbundesamt.de/archiv-e/bvt_textilindustrie_vv.pdf)

European Commission, EU Eco-Management and Audit (EMAS)
(www.ec.europa.eu/environment/emas/index_en.htm)

European Chemicals Agency, Candidate List of Substances of Very High Concern for Authorisation (REACH-Liste)
(www.echa.europa.eu/chem_data/authorisation_process/candidate_list_table_en.asp)

Eurostat
(http://epp.eurostat.ec.europa.eu/portal/page/portal/eurostat/home)

International Finance Corporation, Environmental Health and Safety Guidelines, 2007
(www.ifc.org/ifcext/sustainability.nsf/Content/EHSGuidelines)

International Organization for Standardization (ISO), Industry Standard ISO 14001 for Environmental Management Systems
(www.iso.org/iso/iso_catalogue/catalogue_tc/catalogue_detail.htm?csnumber=31807)

International Organization for Standardization (ISO), Industry Standard ISO 9000 for Environmental Management Systems
(www.iso.org/iso/iso_catalogue/catalogue_tc/catalogue_detail.htm?csnumber=42180)

Council of the European Union, Directive 2010/75/EU of the European Parliament and the Council of 24 November 2010 on Industrial Emissions
(http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2010:334:0017:0119:DE:PDF)

Environmental Awareness Study 2010 of the Federal Environment Agency, in German
(http://www.umweltbundesamt.de/umweltbewusstsein/index.htm)

FURTHER INFORMATION

The Blue Angel – Environmental label of the Federal Republic of Germany
http://www.blauer-engel.de/index.php

Chemical Secretariat ChemSec, Substances of very high concern (SVHC-Liste)
www.sinlist.org

DAU – Deutsche Akkreditierungs- und Zulassungsgesellschaft für Umweltgutachter mbH with environmental assessor database, in German
www.dau-bonn-gmbh.de

Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH
www.giz.de

Deutsche Investitions- und Entwicklungsgesellschaft KfW Bankengruppe
www.deginvest.de

European Ecolabel – environmental label of the EU
http://ec.europa.eu/environment/ecolabel/

Europäischen Gewerkschaftsverband, Substances of Very High Concern, Trade Union Priority List
www.etuc.org

International Union of Leather Technologists and Chemists Society
www.iultcs.org/environment.asp

Label database of the consumer initiative, in German
www.label-online.de

Portal of the Federal Environment Agency on the subject of Environmental Technology Transfer
www.cleaner-production.de

UNIDO site with links to centres for production-integrated environmental protection (Cleaner Production)
www.unido.org/index.php?id=5737)

United Nations Environment Program, Cleaner Production in Leather Tanning – A Workbook for Trainers, March 1996
www.unep.fr/shared/publications/pdf/WEBx0031xPA-LeatherTanning.pdf

United Nations Environment Program, Cleaner Production in Textile Wet Processing – A Workbook for Trainers, March 1996
www.unep.fr/shared/publications/pdf/WEBx0033xPA-TextileWet.pdf