ENVIRONMENTAL MANAGEMENT, RESOURCE EFFICIENCY AND CONTINUOUS IMPROVEMENT

November 2017

Version 1.4

LEARNING OUTCOME & RESOURCES

Learning Outcome

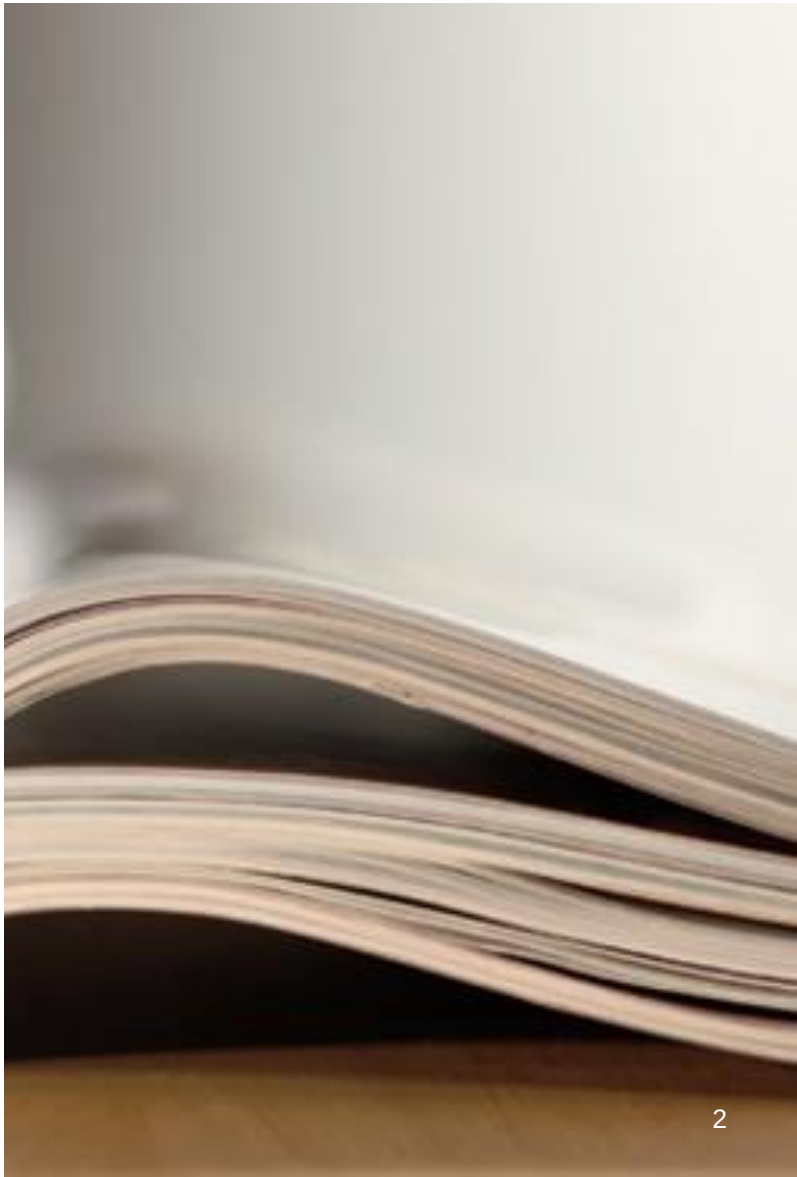
- Knowledge on environmental management, in particular pollution, and preventive measures
- Understand the opportunities from Best Available Techniques (BAT) and get to know more sustainable alternatives
- Understand how Continual Improvement helps to reduce the impact on the environment and implement more sustainable practices.

Resources

- REMC Company Handbook.
- Environmental Standards of the American Apparel and Footwear Association.

Workbook

Refer to complimentary excercises in your workbook.



THE PROBLEM

What problems can occur if we do not manage resources efficiently?

Brainstorm as a group and take notes in your workbook, exercise (20-1).

Consideration of environmental management

Pollutant

- Pollutants were produced during factory production
- E.g. Wastewater, air emission

Comply with national requirement

- Basic requirement for factory operation
- Treat those pollutant from your production

Best practice

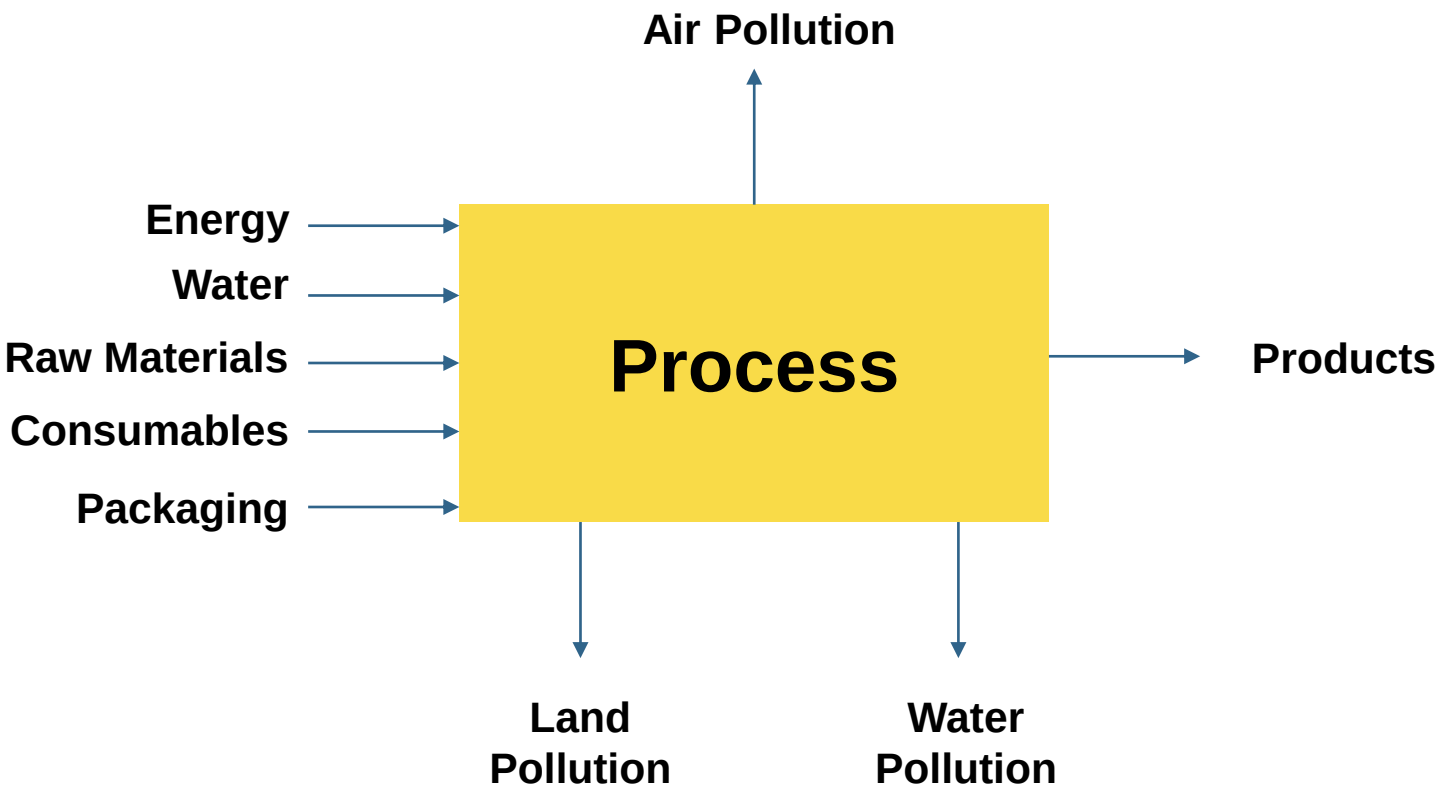
- Also known as Green Production
- Not only treat the existing pollutants but also increase resource consumption efficiency and reduce the pollutant from the source

Management system

- Continuous improvement through systematic and self evaluation.
- E.g. ISO 14001

Pollution

TYPES OF POLLUTION FROM WET PROCESSING



IMPACTS OF POLLUTION ON THE ENVIRONMENT AND HUMAN HEALTH

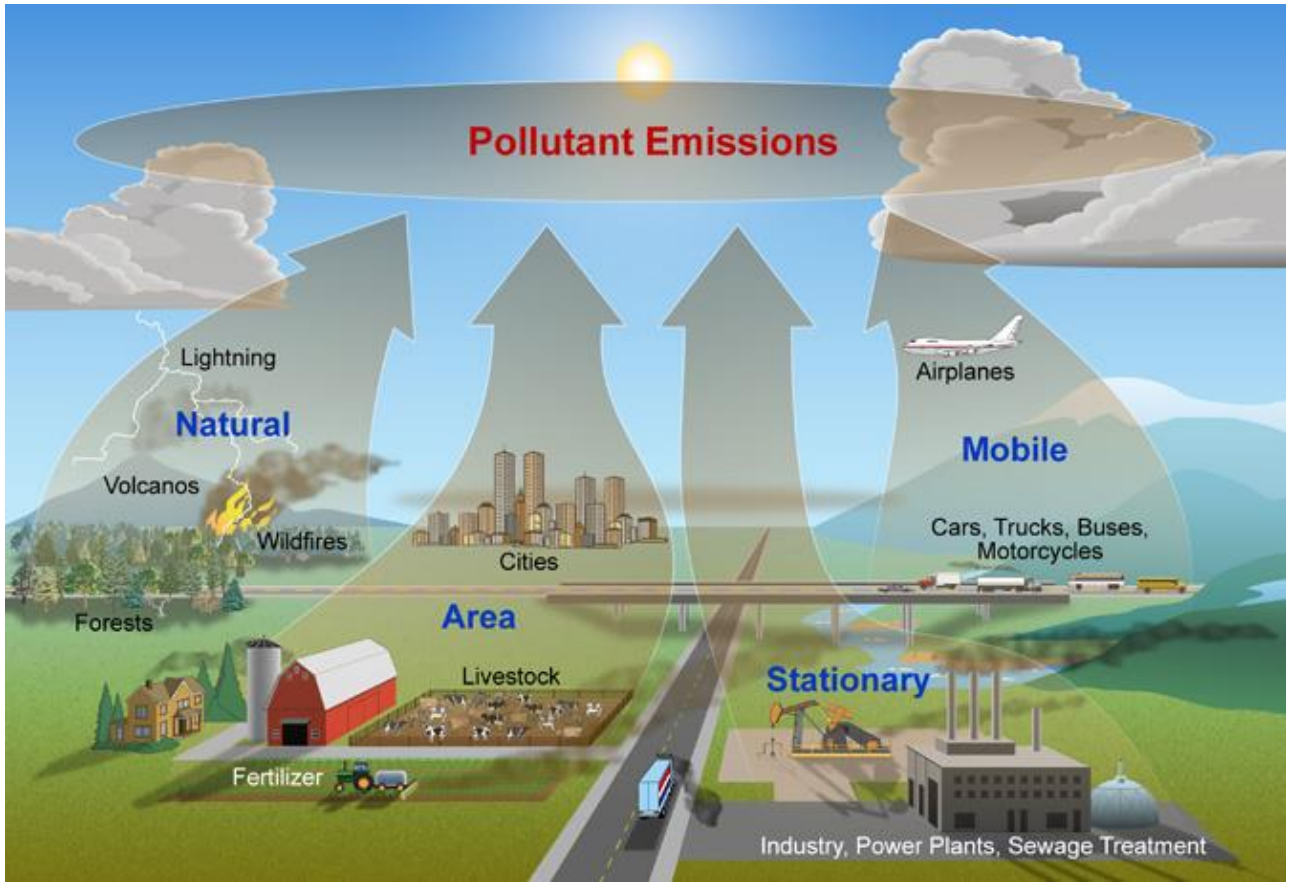
- Carbon dioxide emissions cause ocean acidification.
- GHG emissions lead to global warming which affects ecosystems.
- Invasive species can outcompete native species and reduce biodiversity.
- Nitrogen oxides are removed from the air by rain and fertilise land which can change the species composition of ecosystems.
- Smog and haze can reduce the amount of sunlight received by plants to carry out photosynthesis and lead to the production of tropospheric ozone which leads to plant damage.
- Soil can become infertile and unsuitable for plants.
- Sulphur dioxide and nitrogen oxides can cause acid rain which lowers the pH of soil.
- Poor air quality is the cause of many diseases, such as: respiratory, cardiovascular disease, throat inflammation and chest pain.
- Approximately 14,000 deaths per day are caused by water pollution.
- Oil spills cause skin irritations and rashes.
- Noise pollution can cause hearing loss, high blood pressure, stress and sleep disturbance.
- Lead and other heavy metals have been shown to cause neurological problems.
- Chemical and radioactive substances can cause cancer and as well as birth defects.

Air Pollution

Air Emission - Types

Emissions is the term used to describe the gases and particles which are put into the air or emitted by one of the categories:

- Point (Stationary).
- Mobile.
- Biogenic (Natural).
- Area.



TYPES OF POLLUTANTS

Pollutants	Effects of human being	Sources
Sulphur dioxide	Irritates respiratory system and causes bronchitis	Boiler flue gas, rayon plant etc., Sizing operation
Aldehydes	Irritates all parts of respiratory system	Polyester plant
Chlorine	Causes lung irritation and also irritation in eyes	Processing house, Laundry, Bleaching
Carbon dioxide	Deprives body cells of oxygen and cause unconsciousness by CO combining with hemoglobin	Boiler house
Carbon Monoxide (CO)	Headaches, reduced mental alertness, heart attack, cardiovascular diseases, impaired fetal development, death.	Boiler flue gas, Sizing operation
Nitrogen Dioxide (NO2)	Susceptibility to respiratory infections, irritation of the lung and respiratory symptoms (e.g., cough, chest pain, difficulty breathing).	Boiler flue gas, Sizing operation
Particulate Matter (PM)	Eye irritation, asthma, bronchitis, lung damage, cancer, heavy metal poisoning, cardiovascular effects.	Boiler flue gas, Cotton handling activities
VOC	Health effects include eye, nose, and throat irritation; headaches, loss of coordination, nausea; and damage to the liver, kidney, and central nervous system, some are suspected or known to cause cancer in humans	Drying and curing

CLASSIFICATION OF AIR POLLUTANTS

Natural Contaminants

- Natural fog.
- Pollen grains.
- Volcanic eruptions.
- Etc.

Aerosols

- Dust.
- Smog.
- Mist.
- Fumes.
- Etc.

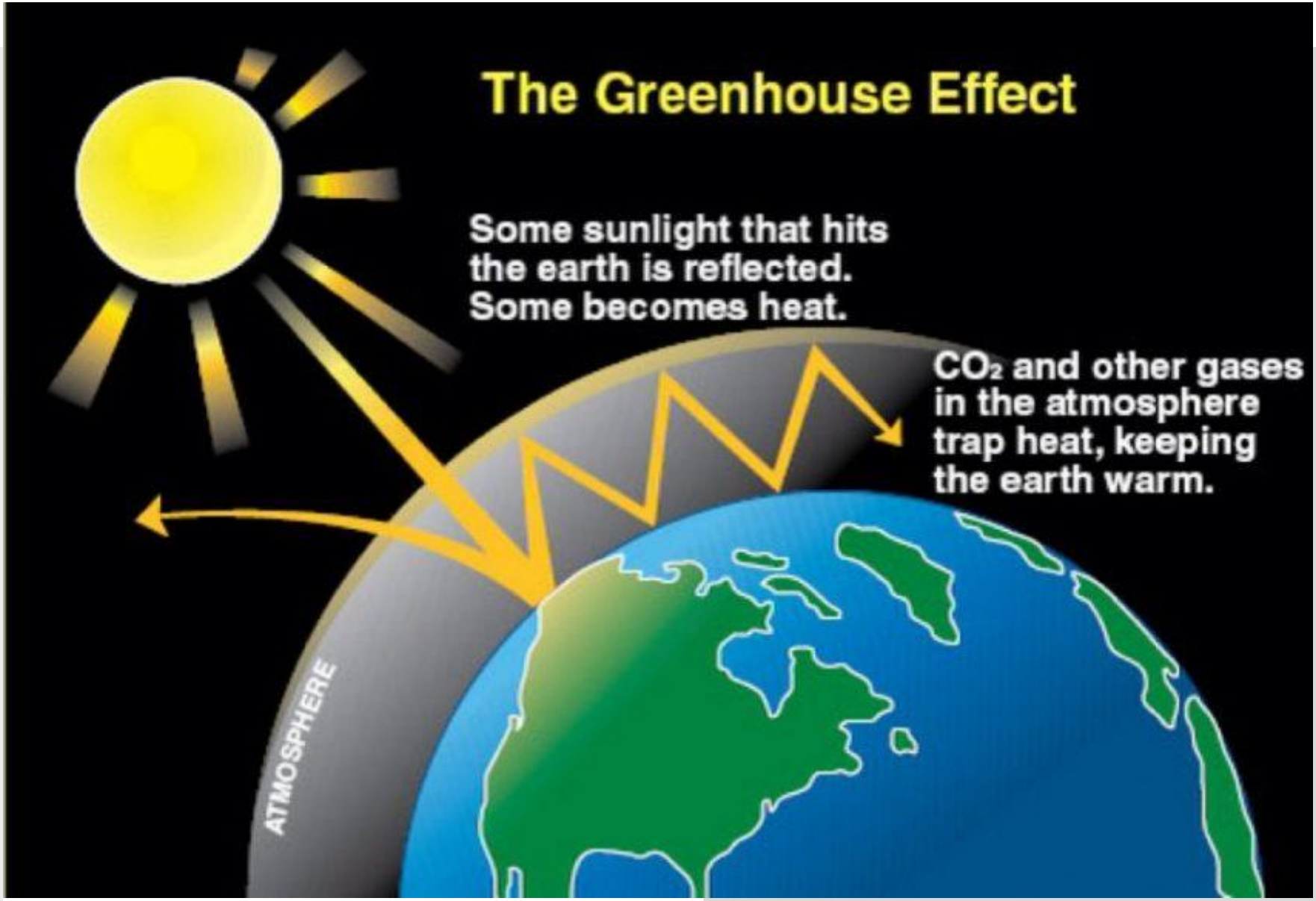
Gases and Vapours

- Sulphur compounds (SOx, H2S, Mercaptans).
- Nitrogen compounds (NOx, Ammonia).
- Oxygen Compounds (O3, CO, CO2).
- Organic Compounds (Aldehydes, Hydrocarbons).
- Halogen Compounds (Chlorofluorocarbons).
- Radioactive Compounds.
- VOC (Volatile Organic Compound).

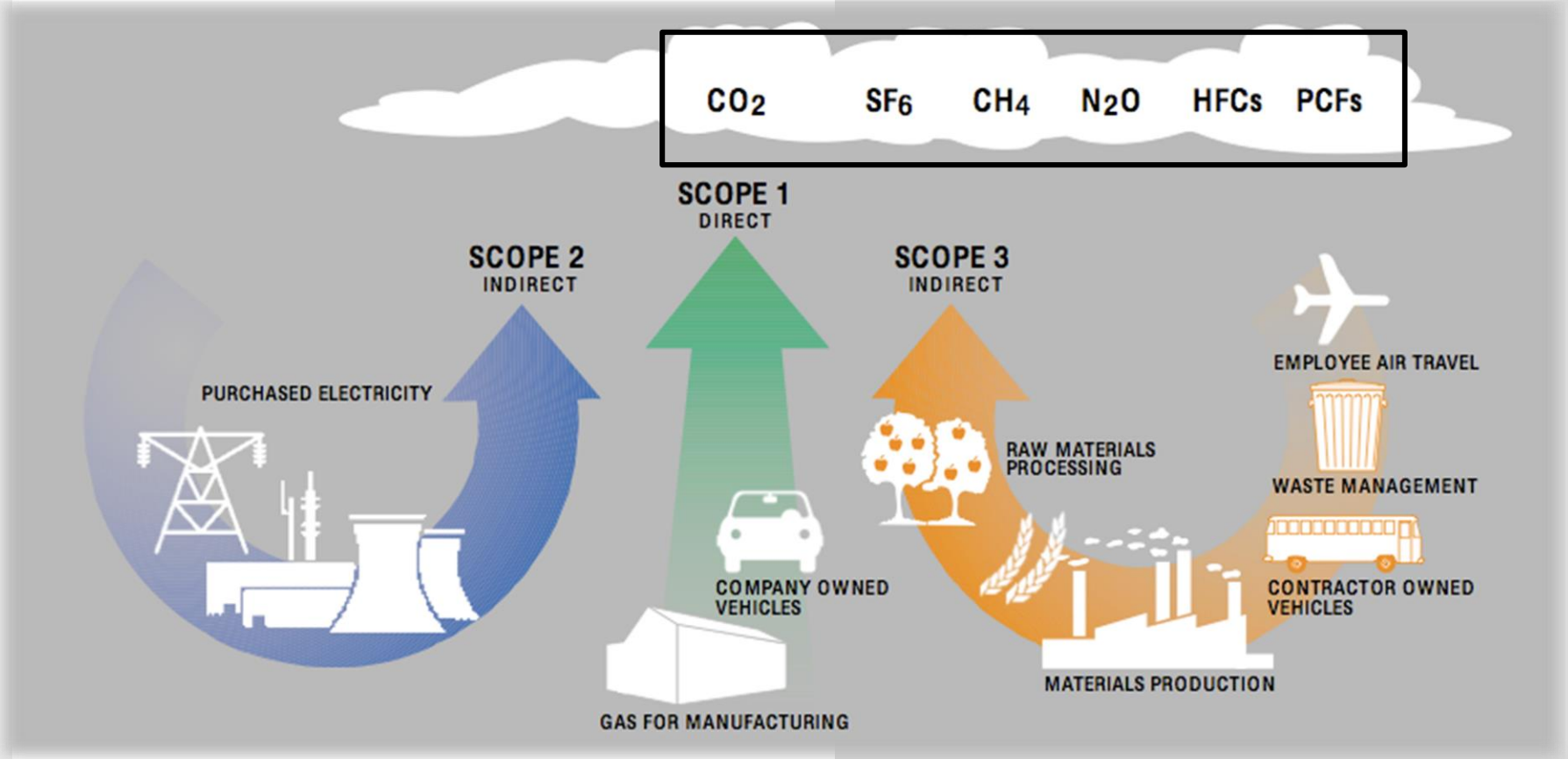
IMPACT FROM AIR POLLUTANTS

- Greenhouse effect.
- Particulate contamination.
- Increased UV radiation (Ozone Depletion).
- Acid rain.
- Increased ground level ozone concentration.
- Increased levels of nitrogen oxides.

The Greenhouse Effect



6 types of Greenhouse Gas (According to <Greenhouse Gas Protocol>)



AIR EMISSIONS FROM TEXTILE PROCESSES

Process	Source	Pollutants
Energy production	Emissions from boiler	Nitrogen oxides (NOx), sulphur dioxides (SO_2) (SOx)
Drying and curing	Emission from high temperature ovens	Volatile organic compounds (VOCs)
Cotton handling activities	Emissions from preparation, carding, combing and fabrics manufacturing	Particulates
Sizing	Emission from using sizing compound (gums, PVA)	Nitrogen oxides, sulphur oxide, carbon monoxide
Bleaching	Emission from using chlorine compounds	Chlorine, chlorine dioxide
Dyeing	Disperse dyeing, carriers sulphur dyeing	Carriers
		H_2S
Printing	Screen printing, rotary printing	Hydrocarbons, ammonia
Finishing	Resin finishing, heat setting of synthetic fabrics	Formaldehyde
		Carriers - low molecular weight
		Polymers - lubricating oils
Chemical storage	Emissions from storage tanks for commodity and chemicals	VOCs
Wastewater treatment	Emissions from treatment tanks and vessels	VOCs, toxic emissions

Water and land pollution

Some examples :

- pH value
- COD/BOD
- Suspended solid
- Heavy metal
- Ammonium
- APEO
- Toxic organic solvent (E.g.: Formaldehyde, Halogenated solvent)

CHINA AIR EMISSION TESTING METHODS

Analytical Parameters	Test Method
Total Air Flow	GB16157-1996
SO_2	HJ 482-2009, GB/T 16128-1995
NO_x	HJ 479-2009
Soot	“Thermal power plant air pollutant emission standards" (GB13223-2003) The principle of "Ringelmann chart" which fit into the objective lens of the telescope. The density of smoke is judged by the Ringelmann scale (0-5 levels) when viewing through the telescope.
Dust	GB/T 5468-1991, GB/T 16157-1996

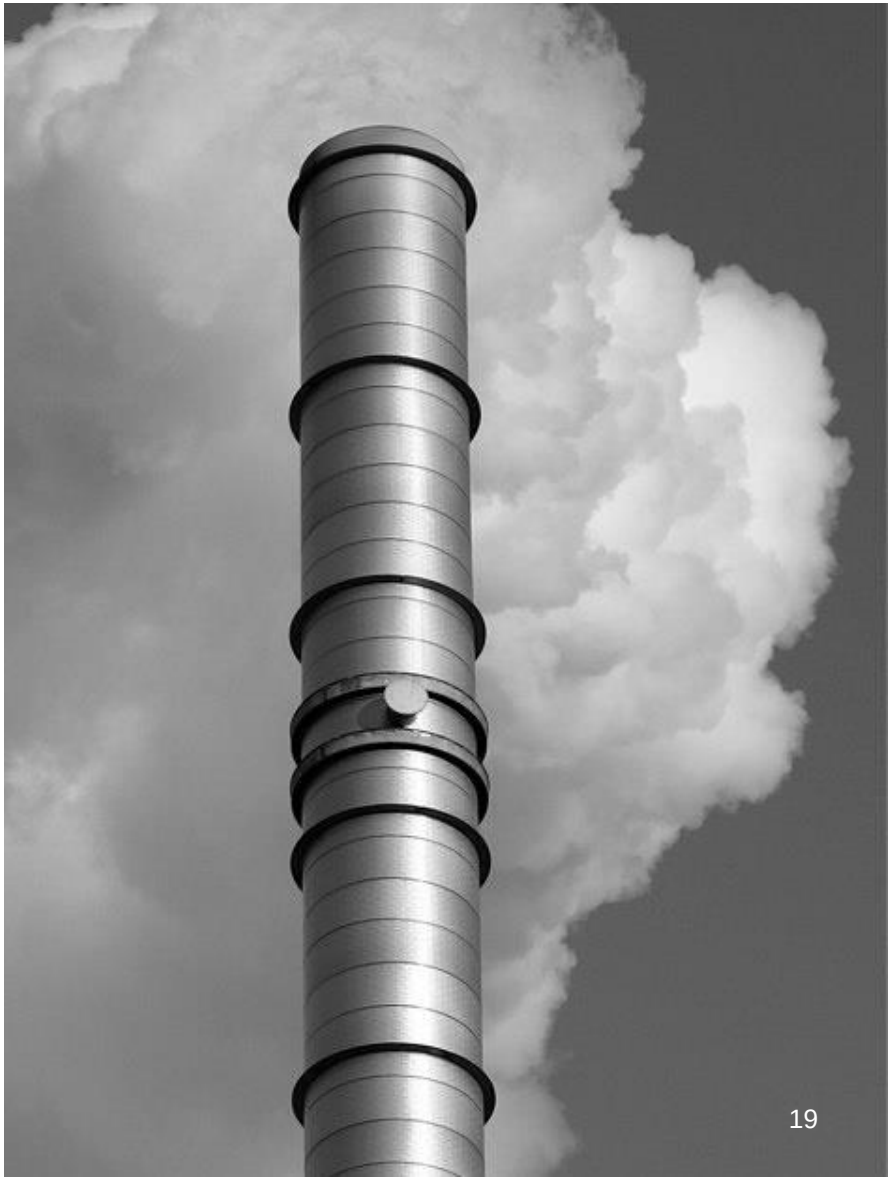
Volatile Organic Compounds (VOCs)

VOCs, are organic compounds that easily become vapors or gases. Along with carbon, they contain elements such as hydrogen, oxygen, fluorine, chlorine, bromine, sulfur or nitrogen.

VOCs, when combined with nitrogen oxides, react to form ground-level ozone, or smog, which contributes to climate change.

LIST OF VOCs

- Fossil fuels
- Benzene
- Methylene chloride
- Perchloroethylene
- Methylenechloride
- Perchloroethylene
- Formaldehyde
- Tetrahydrofuran,
- Cyclohexane,
- Methyl Ethyl Ketone (MEK),
- Toluene, Acetone, Hexane,
- 1,1,1-Trichloroethane,
- Methyl-Iso-Butyl Ketone (MIBK)



EFFECT OF VOCs

Respiratory, allergic, or immune effects in infants or children are associated with man-made VOCs and other indoor or outdoor air pollutants.

Styrene and limonene, can react with nitrogen oxides or with ozone to produce new oxidation products and secondary aerosols, which can cause sensory irritation symptoms. Unspecified VOCs are creating smog.

Some organics can cause cancer in animals; some are suspected or known to cause cancer in humans.

Key signs or symptoms associated with exposure to VOCs include conjunctival irritation, nose and throat discomfort, headache, allergic skin reaction, dyspnea, declines in serum cholinesterase levels, nausea, vomiting, nose bleeding, fatigue, dizziness.

ACTIVITY

REFLECTION

Share your knowledge within the group. Take notes, workbook, exercise (20-2).

What actions have you taken in your facility so far to reduce your environmental impact?

What worked well?

What did not work so well?

Environmental Standards

AIR POLLUTION

Standards

- Discharges to the air from must comply with all permits and applicable laws and regulations.
- The factory must use appropriate controls in order to meet the limits.
- The factory must have all current permits and authorisations required by law for the air discharges.
- The factory must use accepted calculation methodologies to calculate annual air emissions.
- Factories must include emissions from fuel usage as well as from processes.
- All information about emissions must be kept on file for at least five years.
- Any wastes or effluents from air pollution control equipment must be managed and disposed of in accordance with applicable rules and regulations.
- Use of chlorofluorocarbons (CFCs) shall be managed as required by the US EPA.
- Use of US EPA Class I and Class II as a spot remover is prohibited.

Best Practices

- Avoiding open burning of solids wastes.
- Calculating of total Scope 1 and Scope 2 greenhouse gas (GHG) emissions for the entire factory.
- Identifying opportunities to reduce pollutants and toxic chemicals in air discharges product selection, product substitution and process modification.

ENERGY MANAGEMENT

Standards

- Factories must have energy usage data available at the factory for the previous 5 full calendar years.
- Data must include quantity, heat content and sulphur content information for all fuel types.
- Data also must include all electricity use at the factory.

Best Practices

- Factories should develop and implement energy management and conservation procedures for the factory.
- The Programme should address the monitoring and review of energy usage, setting goals and plans for improving energy efficiency and should include provisions for comparing actual performance against the goals.
- The Programme should include all processes, lighting, compressed air systems, heating, ventilation, and air conditioning systems as well as fuel usage in combustion equipment.

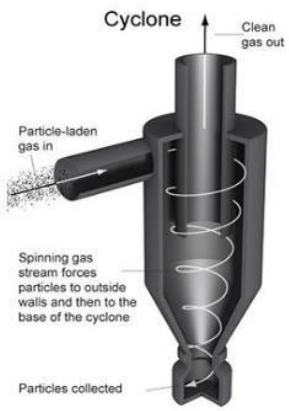
Reference: Environmental Standards from the American Apparel and Footwear Association

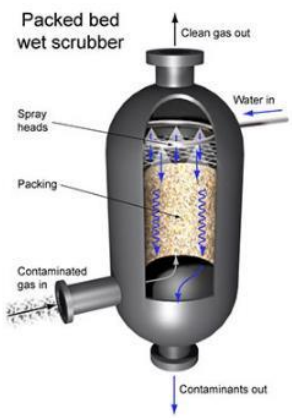
Pollution Prevention

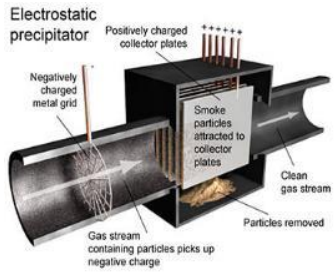
AIR EMISSION TREATMENT TECHNOLOGIES

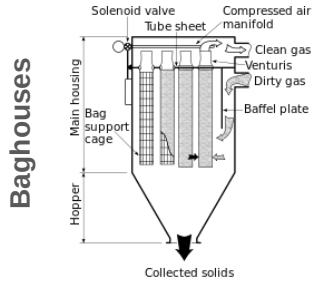
VOC abatement measures include the use of:

- Scrubbers.
- Absorbers using activated carbon.
- Directing the vapors through a combustion system.









Height of chimneys:

Chimneys height should not be less than 30 meters and release the pollutants not in the vicinity of living organism.

Gravitational and inertial separator :

These are working on gravitational and inertial concepts of collecting, filtering etc. of the particulate matter. For example settling chambers, dynamic separator and wet cyclones and multiple cyclones.

Filters:

Woven or sintered metal beds of fibres, metal turning, fibrous mats and aggregate bed filter, paper filters and fabric filters are used for the filtration of particulate matter like dust, lint and fumes.).

QUIZ

What are option to reduce air pollution?

OPTIONS TO REDUCE AIR POLLUTION

- Decreasing emissions of organic solvents by changing to water-based products.
- Using scrubbers to collect particulate matter.
- Optimising boiler operations to reduce the emissions of nitrous and sulphur oxides.
- Pre-screening chemicals using the material safety data sheets to ensure that chemicals are not toxic.
- Identifying sources of air pollution and quantifying emissions.
- Designing and manufacturing products that do not produce toxic or hazardous air pollutants.
- Avoiding fugitive air emissions from chemical spills through improved work.

Best Available Techniques (BAT)

QUIZ

What is understood by the term “Best Available Techniques”?

BEST AVAILABLE TECHNIQUES IN THE TEXTILE INDUSTRY

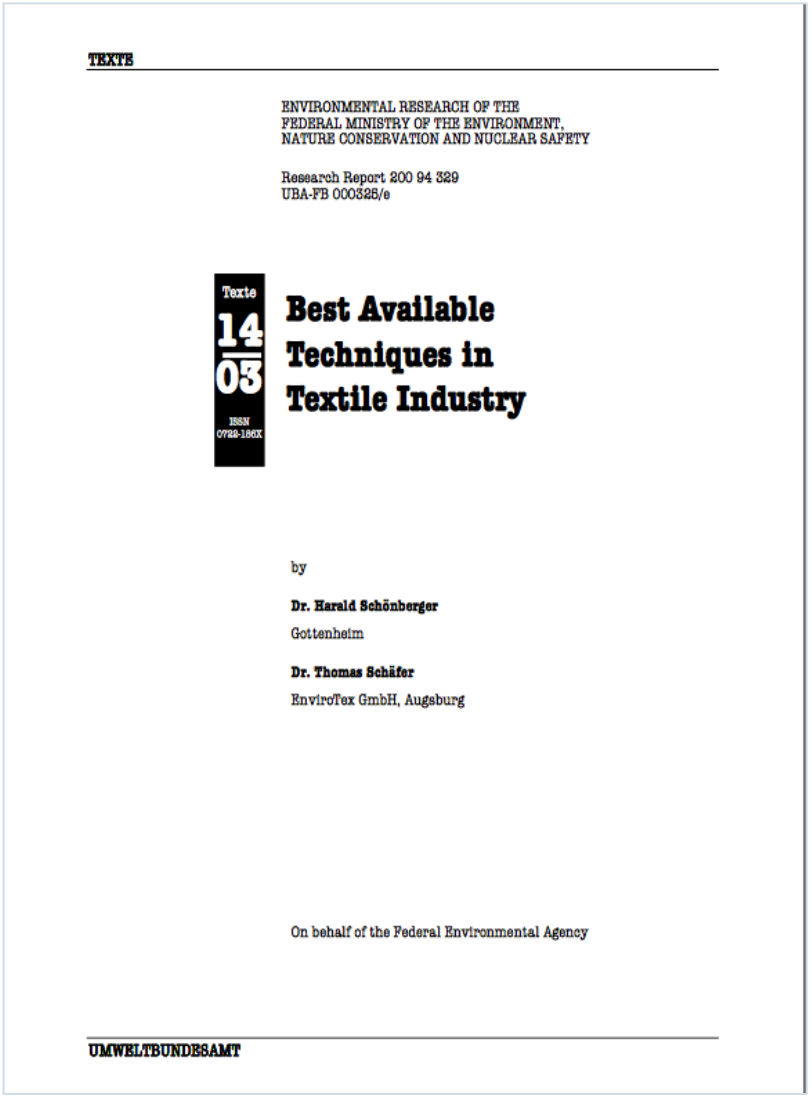
Comprehensive research report published on behalf of the Federal Environmental Agency can be downloaded here:

https://www.umweltbundesamt.de/publikationen/best-available-techniques-in-textile-industry

Scope

Report documents more environmentally conscious textile finishing techniques.

The centrepiece of the report is a compilation of the techniques applied in the textile finishing industry, providing detailed descriptions and a shortlist of BAT.
The report takes into account the considerable diversity of textile fibres (cotton, man-made fibres, wool) and finishing treatments (floc, yarn, knit fabric, woven fabric) as well as their varying objectives.



TEXTE

ENVIRONMENTAL RESEARCH OF THE
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Best Available Techniques in Textile Industry

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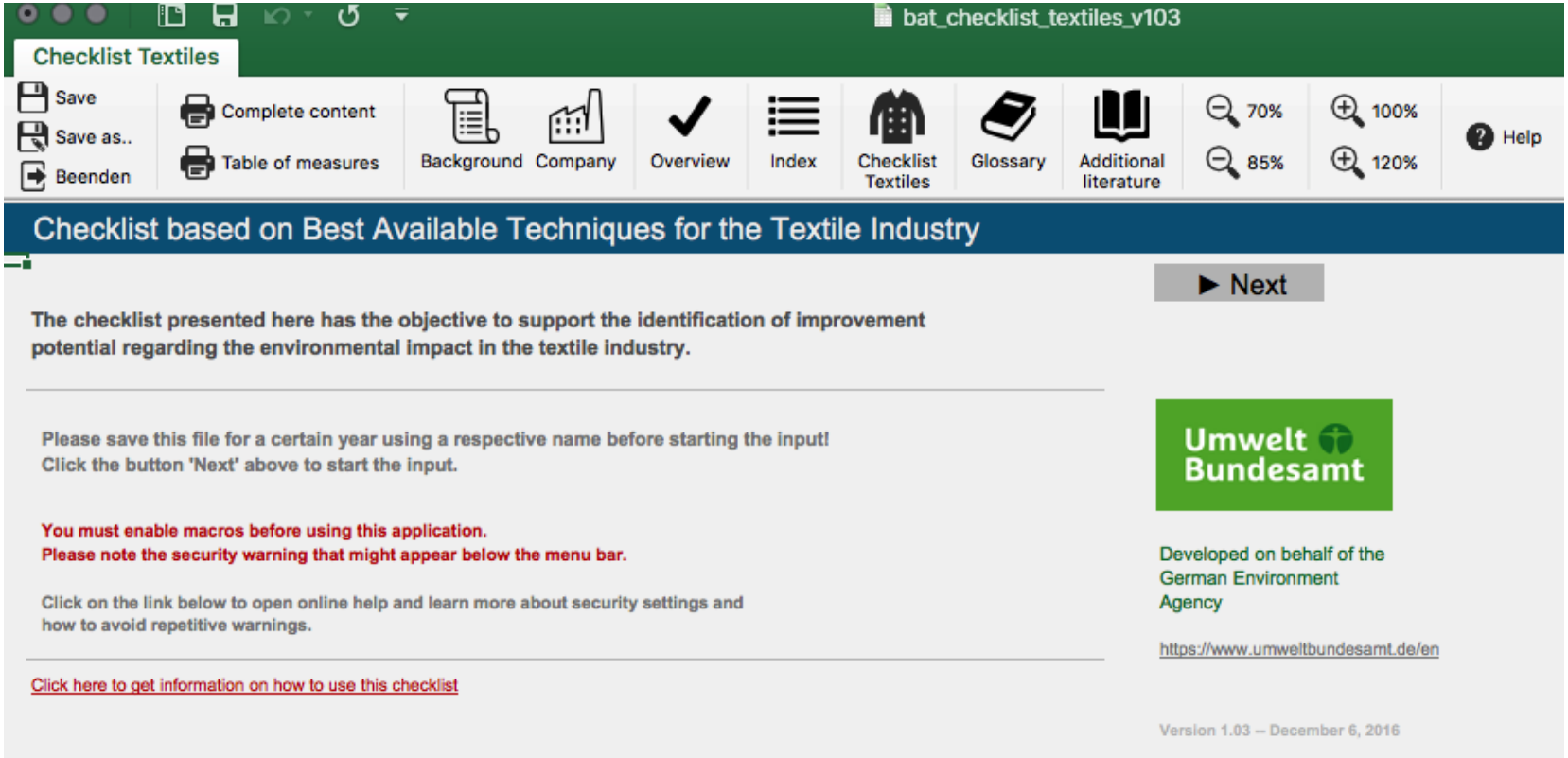
On behalf of the Federal Environmental Agency

UMWELTBUNDESAMT

BAT CHECKLIST

The European Union has published BAT and related reference documents (BREFs) for the textiles industry, based on an information exchange with industry, responsible authorities and NGOs. The checklists have been elaborated to assist producers and external consultants when assessing companies' improvement potential and options for the reduction of environmental impacts. The results serve as an planning tool to take action. Checklist based on the Best Available Techniques research publication can be download here:

https://www.umweltbundesamt.de/en/document/checklists-on-best-available-techniques-for-the



ADOPTION OF BATs

- Evaluate and track your achievements/savings.
- Compare input/output levels before and after the implementation of the BATs.
- Document improvements and savings.
- Report savings and benefits to the management.

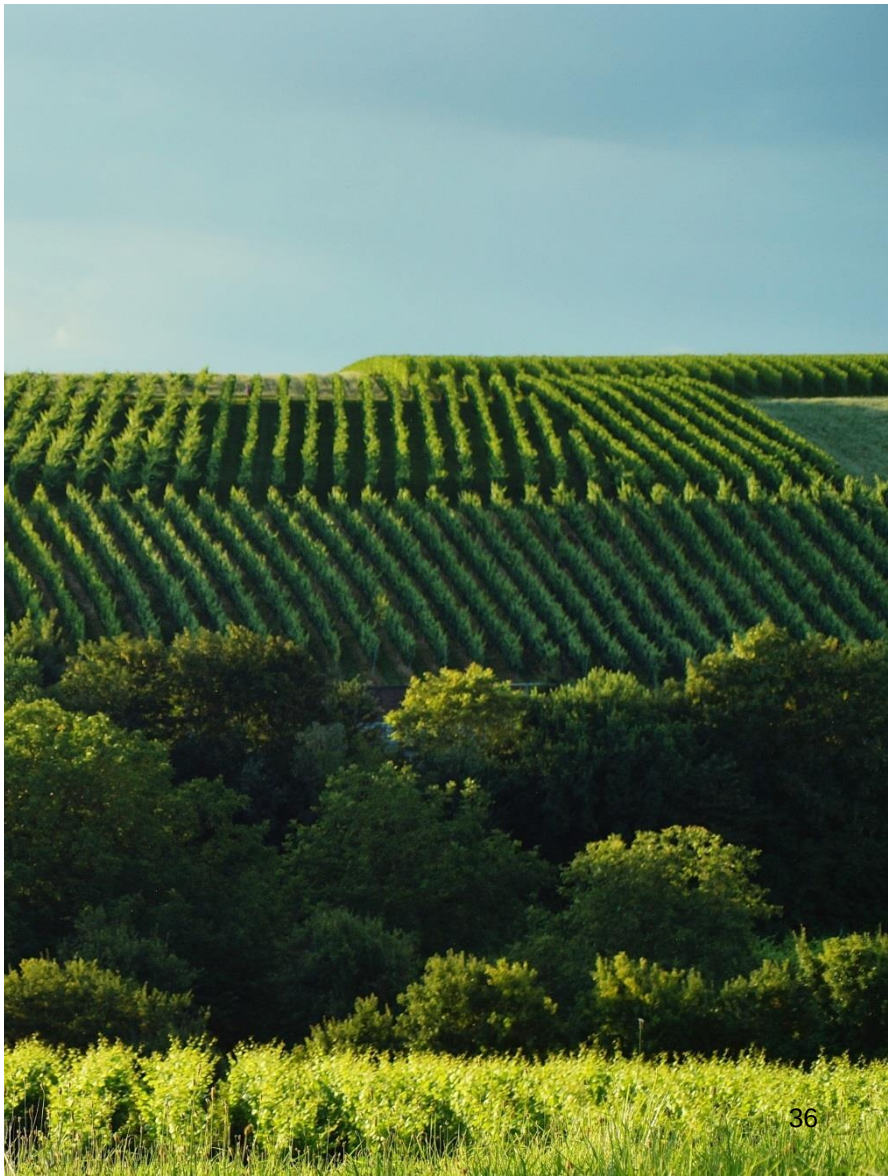
More Sustainable Alternatives

CLEANER PRODUCTION

Cleaner Production is a general term that describes a preventive environmental approach, aimed at increasing resource efficiency and reducing the generation of pollution and waste at source, rather than addressing and mitigating just the symptoms by only technically “treating” an existing waste/pollution problem.

In essence, Cleaner Production is about:

- Preventing waste and pollution at its source.
- Minimizing the use of hazardous raw materials.
- Improving water and energy efficiency.
- Reducing risks to human health.
- Saving money.
- Improving efficient management practices.
- Promoting sustainable development.



Reference:Cleaner (sustainable) production in textile wet processing by E. Alkaya, M. Böğürcü, F. Ulutaş, G.N.Demirer*

CLEANER PRODUCTION APPROACH FOR COST-EFFECTIVE SLUDGE MANAGEMENT

Reduce quantity of sludge generation

- Segregate waste flow from dyeing.
- Use appropriate wastewater treatment technologies with low sludge production.
- Use proper operation and maintenance in the plant. Monitor pH, dosing of chemicals, aeration level, retention time etc.
- Evaluate efficiency of the existing ETP.

Reduce volume of sludge

- Reduce moisture content in the sludge.
- Use techniques such as filter press, vacuum, centrifuge etc.

Reduce the burden of chemical/hazardous load from processing

- ZDHC approach on MRSL: the use of less hazardous chemicals results in less hazardous sludge.
- Know your raw materials.
- Know your dyes/chemicals.
- Substitute dyes/chemicals.
- Process approach.
- New technology.

HEAT AND CAUSTIC RECOVERY

Heat recovery

- Heat-insulation of pipes, valves, tanks, dyeing machines.
- Segregation of hot and cold waste water streams prior to heat recovery and recovery of heat from the hot stream.
- Optimising boiler houses (re-use of condensed water, preheating of air supply, heat recovery in combustion gases) .
- Installing frequency-controlled electric motors.
- Installing heat recovery systems on waste off gases.

Caustic Recovery

- Mercerising is the main source of alkaline (Caustic) load of waste water.
- Rinsing water from mercerising (weak lye: 40 - 50 g NaOH/l) is concentrated by evaporation for re-use in mercerisation.
- Recover and re-use alkali from mercerizing through caustic recovery plant with recycling degree is up to 80%.
- Caustic recovery plant installed will reduce the alkaline load of waste water drastically.

PRE-TREATMENT: CHLORINE BLEACHING

Chlorine Bleaching

- Older process, often replaced already.
- Damaging to materials.
- Byproducts include chloroform and AOX compounds.

AOX compounds → Dioxin

- Toxic.
- Carcinogenic.
- Disruptive of development and hormone systems in humans.
- Toxic to fish.

Pre-Treatment: Hydrogen Peroxide Bleaching

Hydrogen Peroxide Bleaching

- Most common process for cotton.
- Takes 2-5 hours at 75-100° Celsius.
- Requires “clean up”.
- Can weaken tensile strength of material.

PRE-TREATMENT: MORE SUSTAINABLE ENZYME BLEACHING

Enzyme Bleaching:

- Discoloration can be achieved in 60 minutes
- High temperatures not required.
- Caustic Soda eliminated.
- Salt concentration in effluent reduced.
- Less rinsing required.

  – **Combo Bleaching**

  – **Bleach Clean-Up**

INTRODUCTION TO ENZYMES

Enzymes are proteins that **catalyse** chemical reactions:

- Initiate change
- Speed up reactions

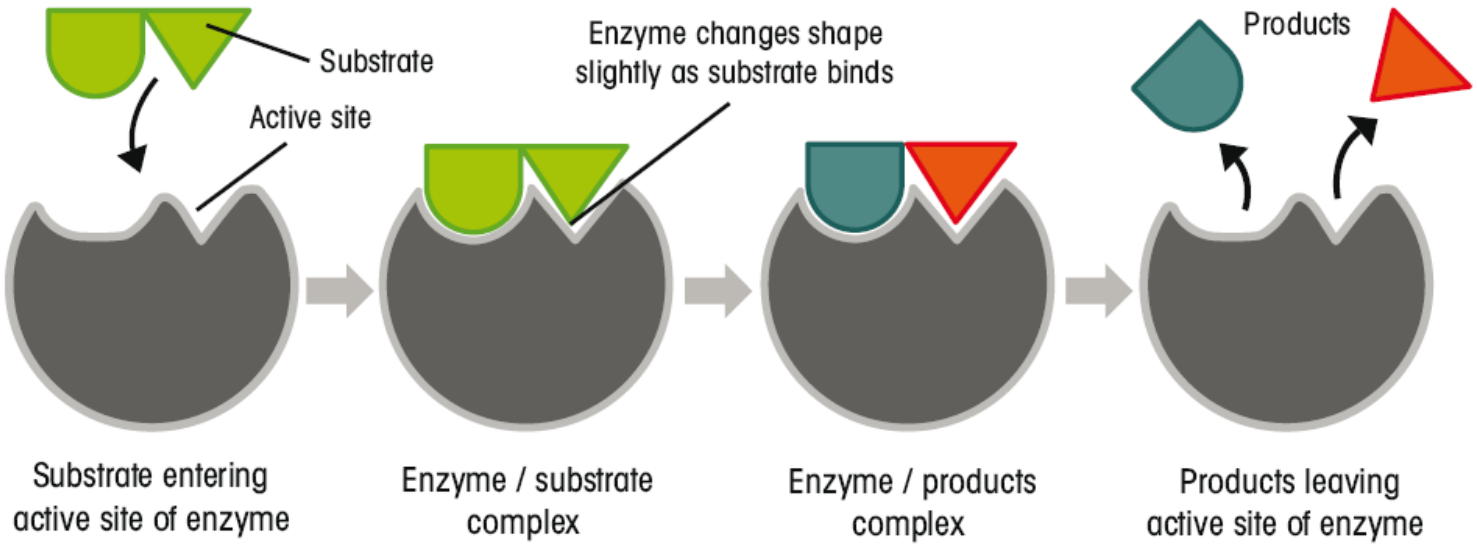


Image (Induced fit diagram): Wikimedia

ENZYME SUMMARY

Advantages come from combining steps:

- Minimising water and energy usage.
- Saving time.
- Enzymes can be altered to work in certain ways or under certain conditions.

Disadvantages:

- Cotton dust in the air:
  - Better quality yarn reduces this risk, and
  - proper personal protective equipment.

Enzyme Scour Example:

4-5 baths and 5 hours → 1-2 baths and 2 hours.

DIRECT DYEING

- Cheap, easy to use.
- Direct dye is often selected for pastels or lighter colours.

- Common source for banned azo amines.
- There is potential for hazardous chemicals in auxiliaries as well as in the dyeing process.
- Chemical post-treatment (potentially with formaldehyde) may be required to improve colourfastness for darker shades.

CONVENTIONAL REACTIVE DYEING

Reactive dying of cotton consumes 20 billion pounds of salt on an annual basis. This is the equivalent of **a half million shipping containers** filled with salt

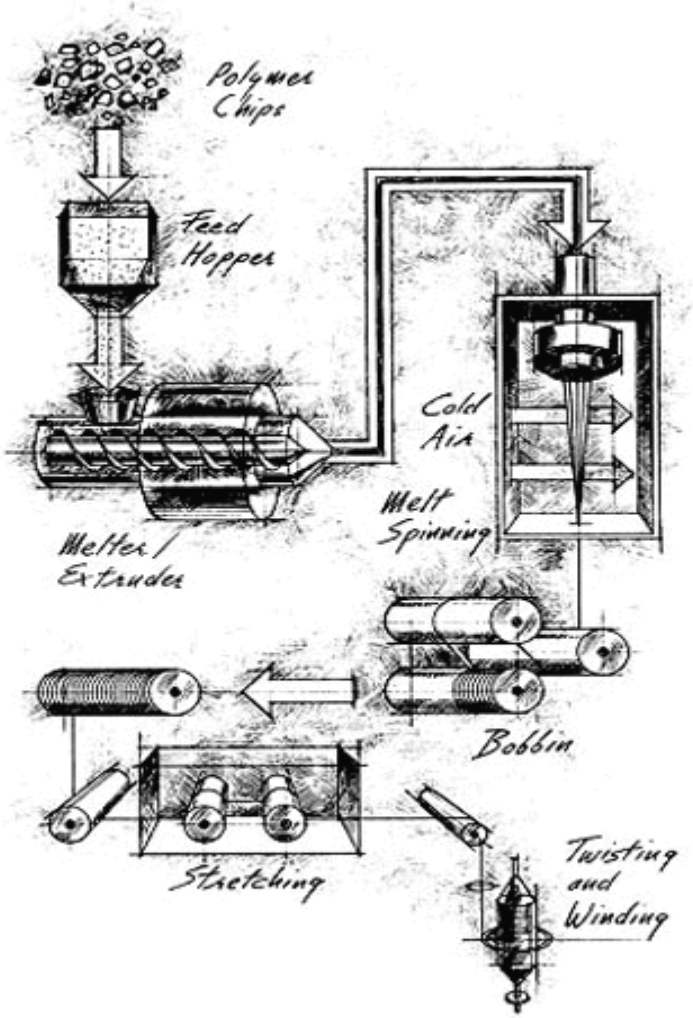
A MORE SUSTAINABLE ALTERNATIVE: HFRD

High Fixation Reactive Dye:
Less water, energy and chemicals

DYEING SYNTHETICS

Traditional dyeing techniques can use around 40 gallons of water to dye just two pounds of textile materials, and as much as 39 million tons of polyester is projected to be dyed annually by 2015.

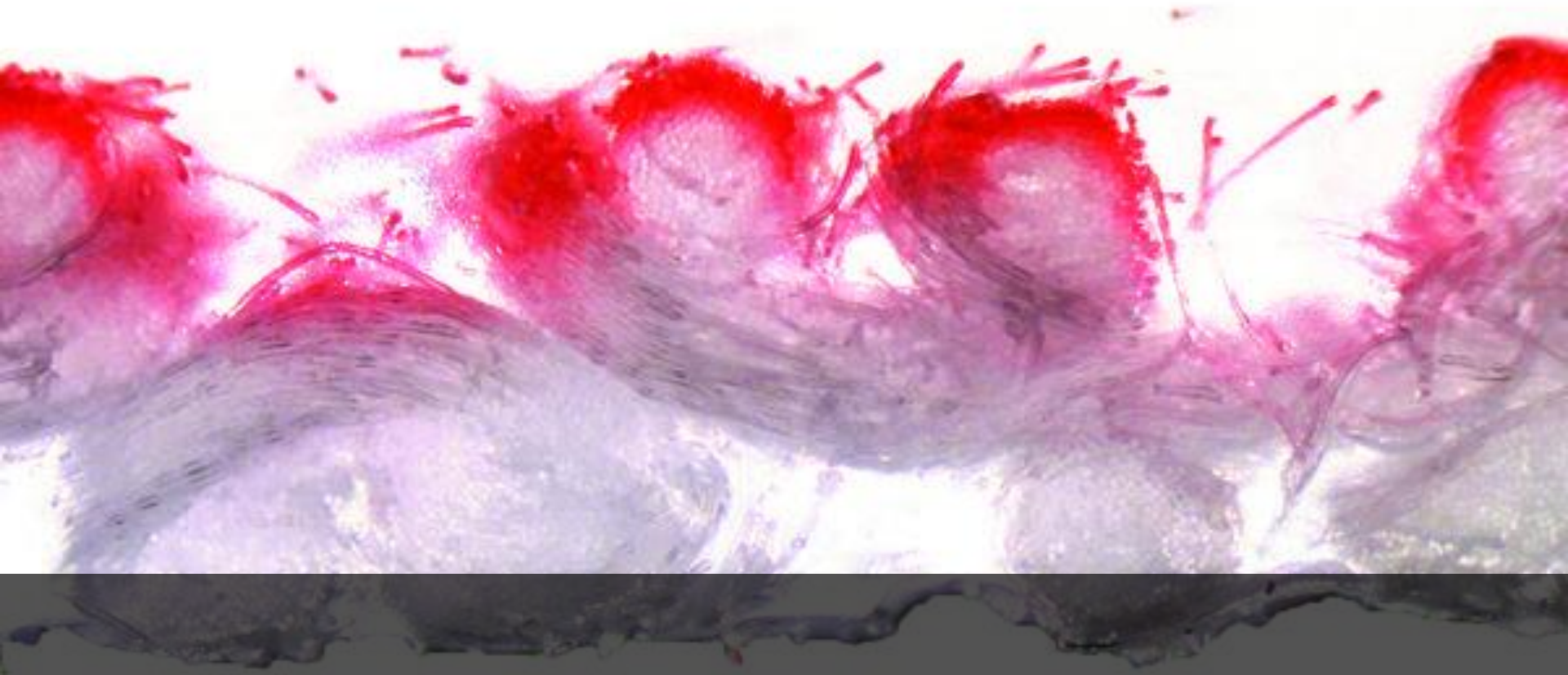
A MORE SUSTAINABLE ALTERNATIVE: SOLUTION DYE



Melt Spinning Polymer from Chip

- Fibres are extruded with pigments already included, so no separate dyeing step is required.

DYEING SYNTHETICS: WATERLESS DYEING



Water replaced with pressurised CO_2

WATERLESS DYEING VIDEO

PIGMENT DYEING

- Pigments are insoluble in water and are helped to stick to the fabric with the use of binders- influencing the colour fastness, as well as wet, dry and washing fastness.

- Range of chemical issues dependent on type of process undertaken.

  – For more sustainable alternatives see ZDHC Gateway – Chemical Module.

ARE NATURAL DYESTUFFS ALWAYS BETTER?

Natural dyes are derived from animals, plants or minerals and are biodegradable...

However, they often require a chemical mordant to fix the dyestuff – these are often heavy metals which can be very damaging to the environment.

CONVENTIONAL PRINTING

Gas emissions are second greatest pollution issue in the textile industry after wastewater contamination. Printing is responsible for much of this.

PVC PLASTISOL PRINTS

- Common for piece-printing, logo t-shirts, sports t-shirts, etc. and prints on dark fabric.
- Ink based on softened PVC.
- Phthalates as plasticizers
  - May be carcinogenic.
  - Likely on RSL.

PLASTISOL PRINTING: PHTHALATES AND PVC

- Phthalates are primarily used to soften plastics (especially PVC).
- Phthalates are a large family of chemicals, some are heavily restricted, some are only regulated and some are not affected by legislation at all (yet).
- Phthalates are carcinogenic and can release dioxin when incinerated.
- Phthalates and PVC are closely related. A usage-ban on PVC will remove a majority of phthalates in garments.
- Many brands, including H&M, C&A, Levi's and G-Star have already banned PVC.

MORE SUSTAINABLE PRINTING: MORE OPTIONS

Bio-Discharge Printing:

An alternative to conventional discharge printing based on enzymes such as horseradish peroxidase.

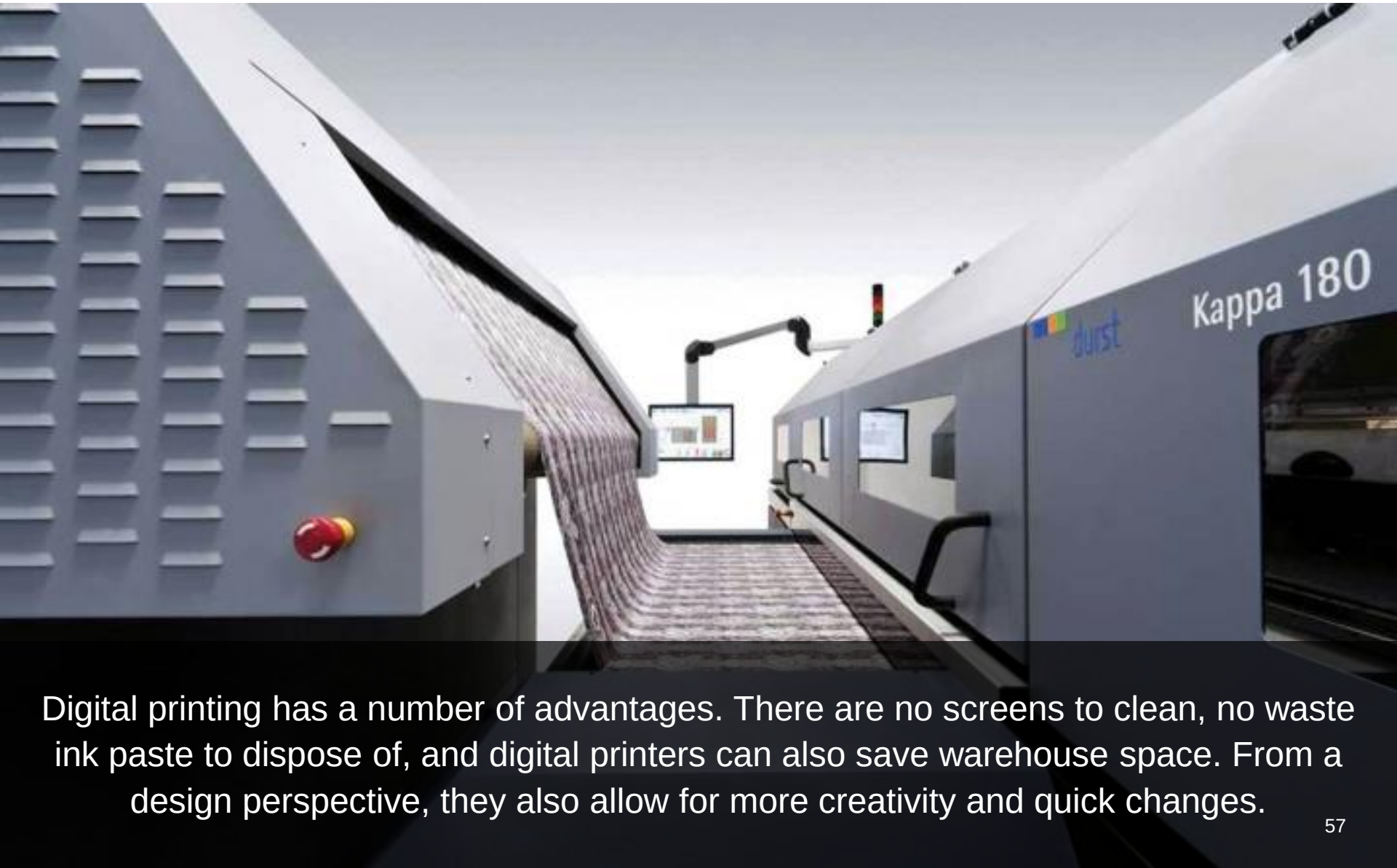
PA/PU Water-Based Prints:

Compared to plastisol, water-based inks significantly reduce the use of and worker exposure to potentially hazardous chemicals.

Silicon-Based Inks:

Unlike plastisol inks, silicone based inks do not contain PVCs and plasticisers. Since the ink consists of 100% silicone, it does not contain solvents or water, allowing for quick curing at relatively low temperatures.

DIGITAL PRINTING



Digital printing has a number of advantages. There are no screens to clean, no waste ink paste to dispose of, and digital printers can also save warehouse space. From a design perspective, they also allow for more creativity and quick changes.

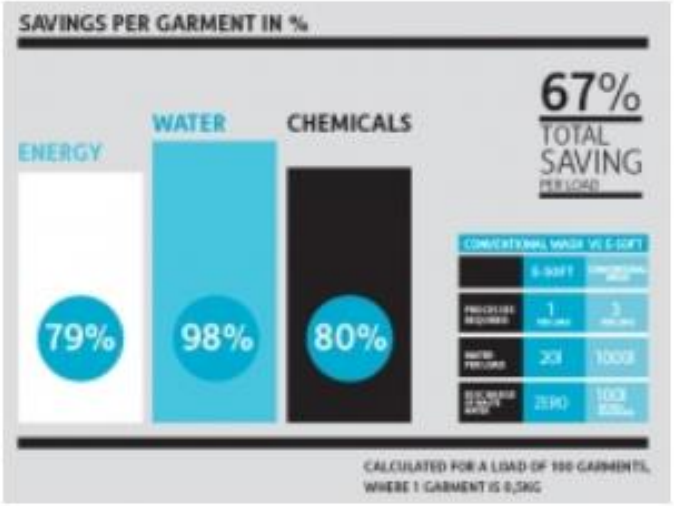
FINISHING:
CONVENTIONAL SILICONE SOFTENING

- Silicone softeners are widely used.
- Additional chemicals like surfactants including APEO may be required.
- Some silicone types (such as Octamethylcyclotetrasiloxane, or D4) are environmentally toxic and hazardous to human health.
- Application generally requires substantial water, and results in wastewater that must be treated.
- The softening effect is subtle and temporary.

Courtesy www.fibre2fashion.com

ALTERNATIVE APPLICATION PROCESSES

- Rather than using water baths to apply softening agents, it is possible to use a fine mist of bubbles.
- Jeanologia, the firm pioneering the technology, refers to this process as ‘nano-bubbles’.
- The softening system is called E-flow and can replace conventional and often resource-intensive application processes.
- This saves massive amounts of water, energy, and chemicals.
- Zero liquid discharge can be achieved.
- The technology will be expanded to other processes such as dye and resin application.



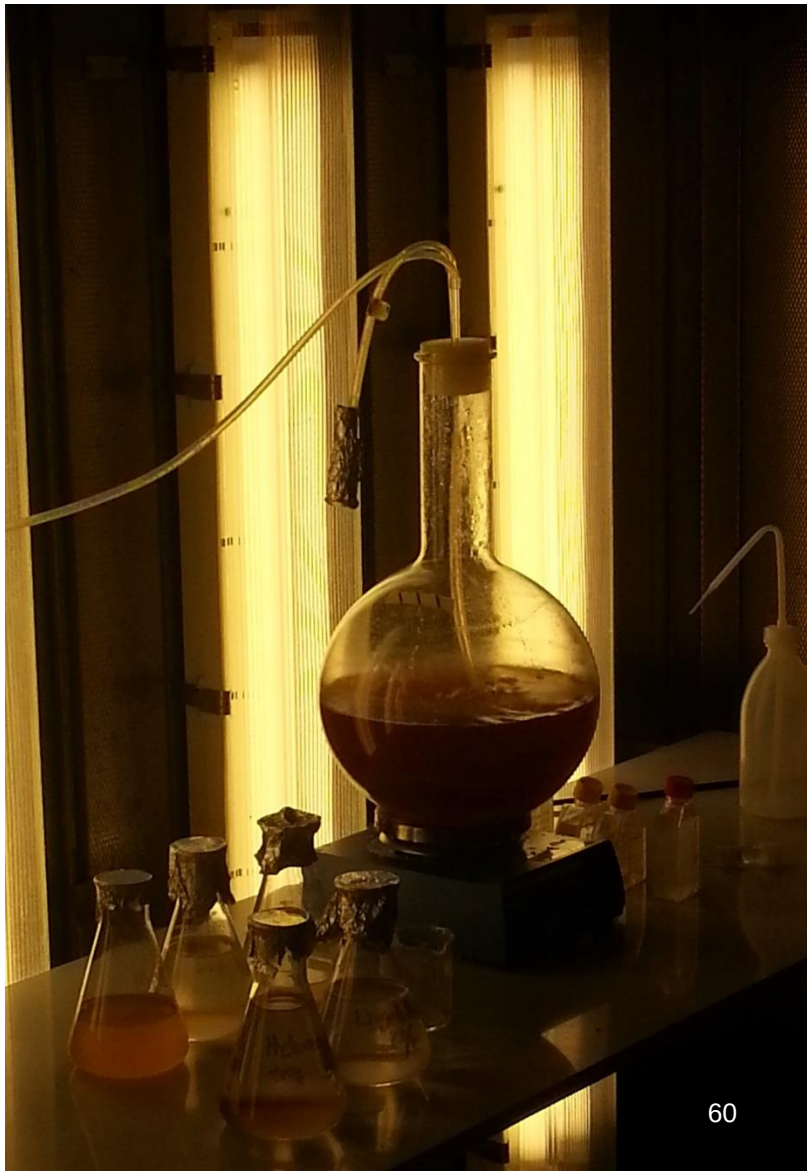
Courtesy Jeanologica http://www.jeanologia.com/es/cat/_fashion/

Courtesy Jeanologia http://www.jeanologia.com/technology/e-soft_/

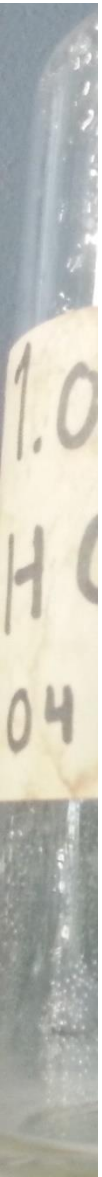
DURABLE WATER REPELLENT (DWR) TREATMENTS

Perfluorinated Chemicals (PFCs). Used to make garments water, oil and stain-proof.

- A difference is made between long-chain PFCs and short-chain PFCs.
- Very hard to degrade, persists in the environment for long periods of time.
- Mostly used in outdoor clothing but can also be used in stain-proofing light-coloured shirts and trousers.
- Some PFCs are suspected to be hormone disrupting, carcinogenic and toxic to reproduction.
- Some PFCs are already banned while others are awaiting legislative action.



FINISHING: ALTERNATIVE DWR TREATMENTS



More Sustainable Alternatives

- There is currently a debate about short-chain PFCs.
- Most brands on the market are moving away from long-chain PFCs to short-chain PFCs.
- Non-PFCs alternatives are however available for most applications.
- In general: Water-proofing is relatively easy to attain without fluorine-technology.
- Oil-repellency however is harder to achieve to the same standard as long-chain PFCs.

ORGANOCLICK & OC-AQUASIL TEX™

OC-Aquasil Tex™ is a fluorocarbon-free (e.g. PFOS, PFOA, etc) water repellent developed by Swedish based firm, OrganoClick AB.

The OrganoTex® technology uses plant-based catalysts to bind water repellent “fatty” molecules directly to the textile fibres.

The plant-based catalysts create a 3D-structured fabric surface of “fatty” molecules.

The 3D-structured fabric surface still feels smooth and its roughness is invisible to the eye.

It is also biodegradable.

WATER-BASED TECHNOLOGY TO PRODUCE POLYURETHANE AND POLYESTER/POLYAMIDE MICROFIBERS

- Nonwoven-based polyurethane and polyester/polyamide microfibers (generally known as suede) are increasingly used in many fields of application and in a diversity of products.

- Production of nonwoven is a method involving different solvents and processing aids such as below:
  - Trichloroethylene.
  - Tetrachloroethylene.
  - N,N-dimethylformamide.
  - Antimony trioxide.

- Alternative technology to produce microfibers using water as the only solvent called as Dinamica®.

- This also gives the materials flame retardant properties.

Source: http://www.subsport.eu/case-stories/364-en

ACTIVITY

DISCUSSION

Take notes.
Workbook,
Exercise (20-3).

Which Best Available Techniques have you applied?

Which experiences have you made?

Which further Best Available Techniques are you aware of?

Continual Improvement Process

What is the continual improvement process?

Continuous improvement is a method for identifying opportunities for streamlining work and reducing waste.

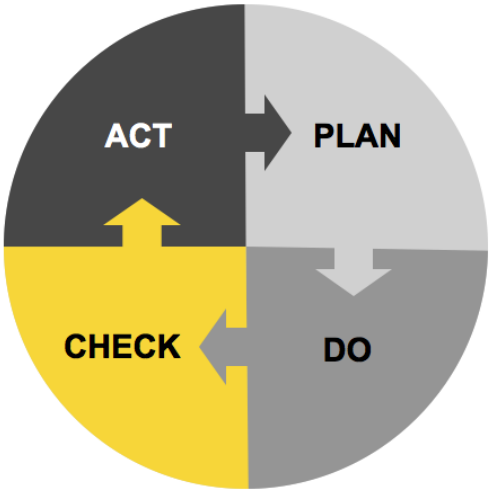
Benefits:

- Motivation, awareness and involvement of employees.
- Improving teamwork.
- Reduction of operational costs, as a result of:
  - Improving environmental performance.
  - Streamlining the existing processes.
  - Introduction of new, or efficient processes.
  - Reducing the amount of raw materials used.
- Reduction of incidents.
- Conservation of energy.
- Facilitation in obtaining permits and approvals.
- Reduction of environmental risks.

LINKING CONTINOUS IMPROVEMENTS AND ENVIRONMENTAL MANAGEMENT SYSTEMS

Most commonly used framework:

- ISO 14001 standard
- Based on Plan-Do-Check-Act methodology



Five main stages as defined by ISO 14001:

- **Stage 1:** Commitment and establishing the baseline.
- **Stage 2:** Identifying and ensuring compliance with legal and other requirements.
- **Stage 3:** Developing objectives, targets and programmes.
- **Stage 4:** Implementing and operating EMS.
- **Stage 5:** Checking, auditing and management reviews.
- **Stage 6:** Acknowledgement under a selected scheme.

Identification of environmental aspect & Impact

Step 1 Select an activity, a product or service

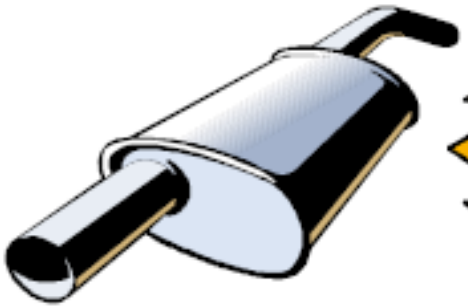
Step 2 Identify environmental aspects of the activity, product or service

Step 3 Identify environmental impacts

** Potential, positive and negative with each identified aspect*

Activity, Aspects & Impacts

Driving a car



Exhaust Gases

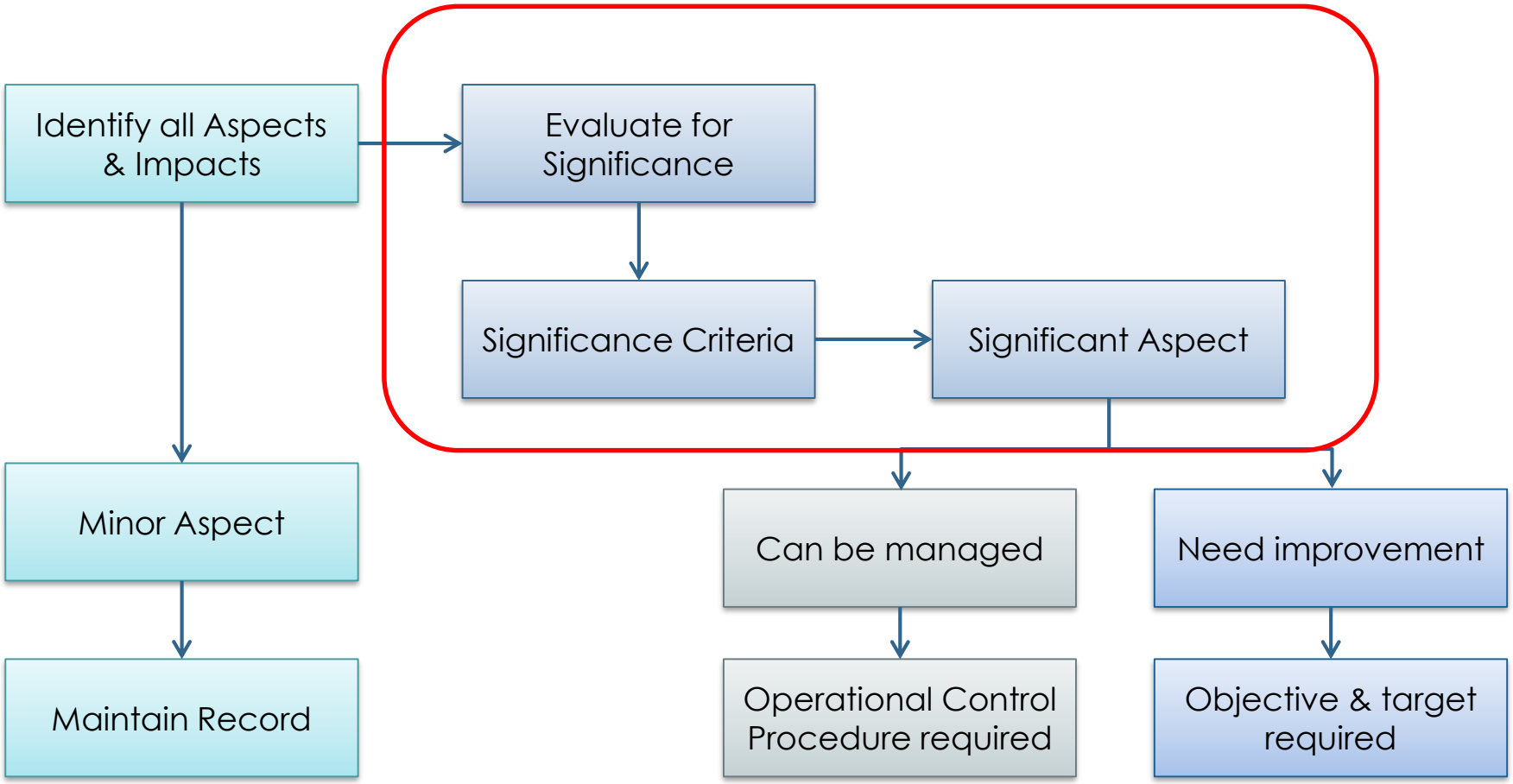
Global Warming

Car washing

River pollution

Fish killed

At EMS Planning Stage



IMPLEMENTATION TOOL
IMPROVEMENT BOARD

IMPROVEMENT BOARD

Goal	Identify areas of improvement. Why do the things you do? Which obstacles do you encounter, while carrying out your job? Does your work add value? How can you reduce environmental impact?
How	Write down your ideas on a sticky note and place on this board. In the weekly meeting, introduce to your team.
Follow-up	Start improving!

NEW

- Add controls
- Get new generator
- Fix wire

WORK IN PROGRESS

- Set up chemical storage
- Supplier approval process
- Secondary containment
- SDS in local language

ON HOLD

- PFC substitute

RESULT / SUCCESS

- PPEs
- KPI Tracking
- Increase temp
- Policies

MONITOR

- Trainings

Open To Questions

SUMMARY

Every participant to feedback with one key learning from the session.

Take notes in your workbook, exercise (20-4).