

Training Guideline for the Training Course “Chemical Reuse, Recycling and Recovery for Service Provider”

**Deutsche Gesellschaft für Internationale Zusammenarbeit
(GIZ) GmbH**

**Program on Promoting Sustainability in the Textile and
Garment Industry in Asia (FABRIC)**

Guideline for Trainers and Facilitators



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| Purpose This document has been prepared to guide trainers, facilitators and service providers in the field of Chemical Reuse, Recycling and Recovery. | |

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List of abbreviations used

| | |
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| CM | Chemical management |
| CMS | Chemical management system |
| DSHC | Digital Solutions for Substitution of Hazardous Chemicals in the Fashion Supply Chain initiative |
| FABRIC | GIZ Project on Promoting Sustainability in the Textile and Garment Industry in Asia |
| GHS | Globally Harmonized Systems of Classification and Labelling of chemicals |
| GIZ | Deutsche Gesellschaft für Internationale Zusammenarbeit |
| MRSL | Manufacturer restricted substances list |
| REMC | Resource efficient management of chemicals |
| RSL | Restricted substances list |
| ZDHC | Zero Discharge of Hazardous Chemicals initiative |

1 About this guideline

The objective of this document is to provide guidance to trainers, learning facilitators and service providers which will be in charge to disseminate Chemicals management knowledge. This trainer guideline is focusing on the contents of the training course Chemical Reuse, Recycling and Recovery.

The materials are primarily intended to help the trainer to increase their knowledge on chemical management and to integrate chemical management aspects in their advisory services. The materials refer to international chemical management reference standards, the conformance to national standards and regulations must be checked and eventually adapted.

In order to ensure good use of the materials available, it is suggested that users of this trainer guideline also familiarize themselves with the REMC toolkit and additional training materials (e.g. DSHC) corresponding guidelines for service providers. You can download the materials here:

www.sia-toolbox.net/solution/resource-efficient-management-chemicals-textile-and-leather-sector-companies

The GIZ Chemical Management Self-Learning course and links to REMC materials are available via the GIZ administered “atingi” learning platform. The CM self-learning master materials are managed by the GIZ, which also looks after the review and updating of learning materials.

This trainer guide is based on the material developed and used for the Training Chemical Reuse, Recycling and Recovery for Service Providers.

1.1 Overview of the presentations and related learning materials

The training course consists of eight topic-specific presentations.

Section 2 of this trainer guideline provides an overview of the available presentations used and made available during the special training on Chemical Reuse, Recycling and Recovery for Service Providers. Each presentation contains links to further reading materials and some of them quizzes.

The quizzes help learners to reflect on learning progress as well as recall the key takeaway messages from each presentation.

1.2 Target groups of this trainer guide

The primary target group of this trainer guide are trainers, adviser and service providers which are involved in dissemination training for factory staff concerned with chemical management and cleaner production. However, this training program also aims at those who want to familiarize themselves with the concept, elements, and requirements of Chemical reuse, recycling and recovery in line with prevalent expectations in international textile/garment supply chains.

1.3 How to use this guideline

There are various options regarding how you as a trainer, learning facilitator, or service provider can employ or integrate the training course Chemical Reuse, Recycling and Recovery and its presentations into own training or advisory activities. It is possible to integrate the presentations directly into virtual or face-to-face workshops with the learners and use these instead of presentations and training materials

such as your own. In this setting, your role would be to directly reflect on the content of the entire learning unit presentations (or parts of them) together with the participants of your workshop.

Section 2 of this guideline provides a more detailed description of all the available presentations. Apart from stating the purpose of the respective presentation, you will also find (i) an overview of the content of the presentations, (ii) available materials (e.g., presentations, quizzes, assignments), (iii) references to additional training and reference material and (iv) the average estimated time required for completing the presentation.

Table 1 – presentations on Chemical Reuse, Recycling and Recovery

| Presentations |
|---|
| Presentation 1: Chemicals used in textile processing mills |
| Presentation 2: Introduction to Material Flow Cost Accounting, MFCA |
| Presentation 3: Application of MFCA on Chemical Streams |
| Presentation 4: Best Available Techniques |
| Presentation 5: Evaluation and Economic Assessment of Chemical Streams |
| Presentation 6: Case Study on Caustic Recovery Plant |
| Presentation 7: Techno-Economic Assessment for Chemical Reuse, Recycling and Recovery |
| Presentation 8: Advancing to Circularity |

Experience shows that the learning process may be more effective if the participants already possess a basic level of understanding regarding Cleaner Production and chemical management.

The trainers, learning facilitators can decide whether all presentations or only certain units would be of relevance to the respective participants.

2 Content and structure of the Cleaner Production learning materials

In this section the 8 presentations regarding cleaner production are described below in some detail. First, in the column on the left, the topics covered in each presentation is stated together with the presentations expected learning objectives. The middle column provides a detailed overview of the content coverage of the presentation plus potential applications of the newly gained knowledge. In the column on the right, the learning materials of the module are listed (presentations including the number of slides, quizzes and assignments/exercises) plus links to reference and additional training materials including presentations for use in face-to-face or virtual (follow-up) training.

Solution sheets for the various quizzes as well as assignments as used in the self-learning materials are available for download. You can refer to these materials to develop your own quizzes for use in your tailored course or your blended learning events. .

| Presentation 1: Chemicals used in textile processing mills | | |
|---|--|---|
| Description | Module content | Learning materials |
| This presentation provides a general introduction to chemical management. It also serves as orientation and a primer for selected target groups such as representatives of authorities and company executives, who want to attain a quick understanding of chemical management. | <ul style="list-style-type: none"> Textile Supply Chain targeting Wet Processing Typical Wet Processing Steps Typical Chemicals used in bulk Ranges and benchmarks of resource consumption per kg of product Overview of chemical management elements | <ul style="list-style-type: none"> Presentation 1 with 30 slides time required: 60 min |
| Presentation 2: Introduction to Material Flow Cost Accounting | | |
| Description | Module content | Learning materials |

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| <p>This unit introduces important sustainable production management tools like MFCA (ISO 14051 which complements ISO 14000 family of environmental management system standards.</p> <p>Introduction to Eco Mapping and its visual approach to identify hotspots of environmental problems within the processes. Eco Maps are based on Process Flow Diagrams.</p> <p>EMAS Easy is a simplified version of EMAS regulation and ISO 14001.</p> | <p>Introduction to:</p> <ul style="list-style-type: none"> • ISO 14051, MFCA • Eco mapping, • EMAS Easy | <ul style="list-style-type: none"> • Presentation with 20 slides <p>time required: 45 min</p> |
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Presentation 3: Application of MFCA on Chemical Streams

| Description | Module content | Learning materials |
|--|---|---|
| <p>The presentation introduces inventorying of chemicals and establishing chemical management system framework for promoting responsible usage and prevention of adverse impacts on environment, health, and safety as well as losses.</p> <p>The identification and documentation of hazard/risks related to entire range of production processes, products, non-product outputs (NPO) is addressed.</p> <p>The concept of process and chemicals flow mapping is introduced, as well the Eco-mapping tool for the visualization of process flows is introduced.</p> | <ul style="list-style-type: none"> • Understand purpose and concept of process flow mapping • Familiarise with practical mapping tools <ul style="list-style-type: none"> ○ Flow diagrams ○ Eco-mapping ○ Material Flow Cost Accounting • Exercise Beautiful Colours • Plan your next steps | <p>Presentation with 39 slides</p> <p>time required: 45 min</p> <p>assignment “beautiful colors” time required: 45 min</p> <ul style="list-style-type: none"> • Assignment: Exercise “Beautiful Colours” (45 min.) • Eco-mapping handbook • EMAS/EMS Easy handbook |

Presentation 4: Best Available Techniques

| Description | Module content | Learning materials |
|--|--|---|
| <p>This presentation describes the Best Available Techniques (BAT) concept and the system of related reference documents</p> | <ul style="list-style-type: none"> • Introduction of BREF – Best Available Technique Reference Document | <p>Presentation 4 Presentation with 22 slides</p> |

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| <p>BREFs, which determine the reference points to set permit conditions covered by the Industrial emissions Directive.</p> <p>Three examples of chemicals recovery options are presented (recovery of sizing agents by ultrafiltration, recovery of caustics from mercerization and printing paste management). The related detailed informed choice descriptions are available in the reference material.</p> | <ul style="list-style-type: none"> • Recovery of PVA • Recovery of Caustic • Recovery of Printing paste | <p>time required: 45 min presentation</p> <p>Additional time for self-study of informed choice documents</p> <p>Informed Choice process descriptions:</p> <ul style="list-style-type: none"> - Recovery of sizing agents by ultrafiltration - Description-Caustic Recovery - Description-Printing Paste Management <p>BAT/BREF doc: http://eippcb.jrc.ec.europa.eu/reference/</p> |
| Presentation 5: Evaluation and Economic Assessment of Chemical Streams | | |
| Description | Module content | Learning materials |
| <p>Case Study on Caustic Recovery Plant (Part 01 Benefits of recovery)</p> | <ul style="list-style-type: none"> • Technical description of a caustic recovery process and plant • Environmental benefits • Environmental performance and operational data | <p>Presentation 5. with 11 slides</p> <p>time required: 75 min, Presentation 45 min, Exercise 30 min</p> <ul style="list-style-type: none"> • Exercise caustic recovery from mercerization by evaporation, • Informed choice matrix document - Description-Caustic Recovery – under MS Teams access |
| Presentation 6: Evaluation and Economic Assessment of Chemical streams (Part 2) | | |
| Description | Module content | Learning materials |
| <ul style="list-style-type: none"> • Case Study on Caustic Recovery Plant (Part 02 Operational Cost of recovery) | <ul style="list-style-type: none"> • Overview of economics of CAPEX and OPEX costs of a caustic recovery plant • Potential return on invest period | <p>Presentation 6 with 10 slides</p> <p>time required: 45 min</p> <p>Informed choice matrix document - Description-Caustic Recovery – under MS Teams access</p> |
| Presentation 7: Group exercise for making Techno-economic Assessment for Chemical Reuse, Recycling and Recovery | | |

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| Description | Module content | Learning materials |
|--|---|---|
| <p>The group exercise uses the business case of sizing agent recovery with the help of ultrafiltration.</p> | <ul style="list-style-type: none"> • Concept of recovery of sizing agents by ultrafiltration • Environmental performance and operational data • Achieved environmental benefits • Operational data | <p>Presentation 7 with 12 slides</p> <p>Total time required: 45 min</p> <p>Presentation 15 min</p> <p>Assignment 30 min.</p> <p>Informed Choice descriptions: Recovery of sizing agents by ultrafiltration</p> |
| Presentation 8: Advancing to Circularity | | |
| Description | Module content | Learning materials |
| <p>The presentation 8 deal with aspects of circularity and gives an overview about the actual state of the art of chemicals recovery, recycling and reuse in the textile finishing sector. Opportunities and limitations are addressed.</p> <p>The option of chemical leasing is presented and factors which must be considered for non-linear use models (circularity model).</p> <p>Circular economy and factors to be considered for non-linear use models are presented.</p> | <ul style="list-style-type: none"> • Overview about the actual state of the art of chemicals recovery, recycling and reuse in the textile finishing sector • Opportunities and limitations • Option of chemical leasing • circularity model • factors to be considered for non-linear use models | <p>Presentation 8 with 19 slides</p> <p>Total time required: 60 min.</p> <ul style="list-style-type: none"> • Waste Directive (2008/98/EC) • UNIDO strategy on Inclusive and Sustainable Industrial Development • Resource Efficient and Cleaner Production (RECP) |

3 Useful links and references

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| | www.atingi.org |
| Best Available Techniques (BAT) reference document in the textile industry | https://eippcb.jrc.ec.europa.eu/reference/textiles-industry |
| COSHH e-tool | www.hse.gov.uk/coshh/essentials/coshh-tool.htm |
| Easy-to-use Workplace Control Scheme for Hazardous Substances (EMKG) – Federal Institute for Occupational Safety and Health, Germany | www.baua.de/EN/Topics/Work-design/Hazardous-substances/EMKG/Easy-to-use-workplace-control-scheme-EMKG_node.html |
| Eco-Mapping | www.sia-toolbox.net/solution/eco-mapping |
| EMAS "easy" for small and medium enterprises – DG for the Environment | https://op.europa.eu/en/publication-detail/-/publication/a46da1ae-edee-47aa-b871-d13baa946379 |
| Environmental standards in the textile and shoe sector – A Guideline on the Basis of the BREFs – Best Available Techniques Reference Documents of the EU | https://www.umweltbundesamt.de/sites/default/files/medien/publikation/long/4289.pdf |
| GIZ Advanced Training Module for Chemical Management in textile wet processes | www.sia-toolbox.net/solution/advanced-training-program-chemical-management-textile-wet-processes |
| GIZ Basic Training Module for Chemical Management in textile wet processes | www.sia-toolbox.net/solution/basic-training-module-chemical-management-textile-wet-processes |
| GIZ Digital Solutions for Substitution of Hazardous Chemicals in the Fashion Supply Chain initiative materials | Made available in CM master course |
| GIZ Resource Efficient Management of Chemicals in Textile and Leather Sector Companies, 2017 | www.sia-toolbox.net/solution/resource-efficient-management-chemicals-textile-and-leather-sector-companies |
| Globally Harmonized System of Classification and Labeling of Chemicals (GHS) | https://unece.org/about-ghs |

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| IFA Column Model as an aid to selecting substitute substances | www.dguv.de/ifa/praxishilfen/hazardous-substances/ghs-spaltenmodell-zur-substitutionspruefung/index.jsp |
| SAC Higg FEM 3.0 – Chemical management | https://howtohigg.org/fem-landing/chemical-management-2020/ |
| Safety in the use of chemicals at work. An ILO code of practice | https://www.ilo.org/public/libdoc/ilo/1993/93B09_147_engl.pdf |
| Substitution Support Portal | www.subsport.eu |
| ZDHC Chemical Management System | https://www.roadmaptozero.com/process |
| ZDHC Manufacturing Restricted Substances List | https://www.roadmaptozero.com/input |
| ZDHC Sampling and Analysis Plan | https://www.roadmaptozero.com/output |
| ZDHC Technical Industry Guide | https://www.roadmaptozero.com/process |
| ZDHC Wastewater Guidelines | https://www.roadmaptozero.com/output |