Improving Chemical Management to Ensure Detox Compliance in a Chinese Dyeing Mill

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1 / INTRODUCTION

Abstract: REWE Group aims to eliminate restricted hazardous chemicals from the production process of private label textiles. In order to learn more about the substitution of hazardous chemicals, REWE Group develops case studies with different suppliers from its textile supply chain. The following case study shows how we support a supplier (a garment manufacturer in China) in his continuous efforts towards a Detox conform supply chain in general, and establishing a comprehensive chemical management system in his supply chain in particular.

Involved supplier: Garment manufacturer and dyeing mill in China.

Aim of the project: Understand chemical compliance management, update chemical and discharge inventories and establish long-term solutions to eliminate/substitute hazardous chemicals.

Project period: May 2015 – Dec 2016.

2 / BACKGROUND INFORMATION

REWE Group Detox program

The REWE Group takes its responsibility for society and the environment very seriously. That is why REWE Group initiated its own program for a safer use of chemicals in the textile production and also joined the Greenpeace Detox Campaign in 2014. The objective of the REWE Detox Program is to assure the use of safer and less hazardous chemicals in the whole lifecycle and production procedures of textiles such as apparel, footwear products, and home textiles for private label products by no later than 2020.

REWE Group supports its suppliers with information and training materials regarding the management of chemicals. The following link could provide further information about our detox program: https://www.rewe-group.com/en/nachhaltigkeit/gruene-produkte/unser-detox-programm

2 / BACKGROUND INFORMATION

Wet processes

With the REWE Group Detox Program, we focus on the crucial stages of textile production in which hazardous chemicals could be used, such as wet processes (e.g. dyeing, washing and printing). The individual wet process is analyzed and a risk assessment is carried out, thereby enabling the evaluation of risks regarding contamination with restricted substances.

Chemical Management

The objective of chemical management is to prevent and control the use of hazardous chemicals in the supply chain. The scope of the chemical management audit conducted in the project is outlined below:

1. Policy: Establish standard operating procedures (SOPs) and a monitoring system for chemical usage practices
2. Documentation: Establish chemical inventory and process flow sheet to verify the flow of chemicals
3. Responsible Personnel: Designate qualified personnel to evaluate SOPs, update Material Safety Data Sheets(MSDS) on a regular basis
4. Training: Hold chemical safety training workshops with employees and subcontractors
5. Third party audit certification: Undergo audit with scoring or rating for factory evaluation
6. Corrective action plan: Purchase, install and test equipment and develop new training materials to improve chemical management performance

3 / DYEING MILL IN CHINA

- The dyeing mill is located in Fujian, China with more than 500 factory staff.
- In the dyeing mill, bleaching, heat-setting, dyeing, finishing and garment washing are performed.
- The dyeing mill processes a variety of textile raw material ranging from wool to polyester and cotton interwoven fabric.

4 / PROJECT OVERVIEW

REWE Group aims to support the dyeing mill in China in order to achieve Detox conformity and establish a comprehensive chemical management system. The project steps are outlined below:

Project steps

a. **Kick-off Meeting and Trainings** with supplier and dyeing mill to explain the project, discuss project steps and to give insights about chemical management, chemical inventory and MSDS monitoring system
b. **Chemical Management (CM) Audit and Testing** to identify hazardous chemicals and identify problems in the documentation and disclosure system of the factory
c. **Corrective Action Plan** with detailed steps for the factory to improve on chemical management and inventory and eliminate the usage of hazardous chemicals
d. **Implementation and Progress Checking** by regular meetings, re-audits, reviews of the documentation and testing
e. **Final Factory Performance Report** to quantify the factory's performance in different areas and summarize the challenges, recommendations and outlook of the project

4A / PROJECT STEP: KICK-OFF MEETING AND TRAINING

Kick-off meeting

- The kick-off meeting was held in May 2015 at the dyeing mill.
- Representatives of the supplier, the dyeing mill, the REWE Group (Corporate Responsibility and Merchandising) as well as representatives from the service provider which supported the project attended this meeting.
- The meeting helped each party to have a better understanding on their roles and responsibilities in this project.
- During the meeting, REWE Group introduced the Detox Program and explained its importance.
- The service provider gave an overview on the project including the main goals, as well as further explained the audit procedures in order to set up clear timelines and milestones for the project.

Training

- Two training workshops on chemical management were conducted in May 2015 and November 2016.
- After the training, the factory gained a better understanding of chemical management system, chemical inventory and MSDS, which enabled them to improve and strengthen their own system.

4B / PROJECT STEP: CHEMICAL MANAGEMENT AUDIT (1/2)

- The initial audit was conducted in January 2016 at the dyeing mill.
- The audit scope covered chemical and wastewater management, alongside with permits check and basic levels of other environmental aspects i.e. energy, water, waste, and air emissions.
- In the audit 5 critical, 10 major and 5 minor non-conformities were detected. The following are examples of positive and critical findings. The critical findings have been closed at the end of the project.

Positive Findings	Critical Findings
The facility has adopted the ZDHC MRSL and made other industry commitments to chemicals management, i.e. OekoTex STeP.	The factory's policy for monitoring and controlling banned and restricted substances was not applied to all chemicals used at the facility.
The facility has a documented upstream supply chain for the raw materials it received for conversion or chemicals used.	Business process was not established to verify all final products manufactured at the facility meet RSL requirements.
Facility implemented a business practice in selecting and purchasing chemicals.	Process was not established to verify all chemicals used in making the products meet applicable permit requirements.
The facility used upstream raw material supply chain for the raw material providers and chemicals providers that have documented commitments to ZDHC MRSL or made other industry chemicals management efforts.	The facility did not have or maintain PPE, safety showers, laboratory/factory eye wash bottles/stations, fire extinguishers, etc. according to the chemical hazards identified in MSDS/technical sheets.
Facility used a 'positive list' from suppliers to purchase chemicals.	ZDHC priority chemical substance detected in the water test report (please refer to the next slide).

4B / PROJECT STEP: CHEMICAL AND WATER TESTING (2/2)

- Four waste water samples have been collected at four different sampling points including incoming water, wastewater before treatment, wastewater after treatment and sludge.
- Certain hazardous chemicals have been found in the production line waste water of the factory (See Table 1).
- APs and APEOs have been detected in one of the waste water samples collected at the discharge point (See Table 2). Flame retardants and heavy metals have been detected in all four samples (See Table 3).
- In dyestuffs heavy metals test, certain heavy metal substances (such as Boron (B) and Zinc (Zn)) have been found in the tested samples.
- APEOs/APs have not been detected in all six auxiliary chemicals samples (See Table 5).
- The test results have been explained to the dyeing mill in detail in order to ensure that they understand the results.

Potential Chemical Groups	I001	I002	I003	I004
Flame Retardants	•	•	•	•
Chlorinated Solvents	o	\	\	\
Heavy Metals	•	•	•	•
APs and APEOs	\	\	•	\
Perfluorinated Chemicals	o	o	\	\

- • – Detected
- o – Not Detected
- \ – Not Tested

Table 1: Water test summary

APs and APEOs	I003
NPEO(mg/L)	0.00583

Table 2: Test result of APs and APEOs

Flame Retardants()	I001	I002	I003	I004
Brominated Flame Retardants	ND	ND	ND	**ND**
Chlorinated Flame Retardants	ND	ND	ND	**ND**
Boric Flame Retardants	**0.017**	**0.020**	**0.055**	0.081
Other Flame Retardants	ND	ND	ND	**ND**
Note: ND = Not Detected (< 10mg/kg)				

Table 3: Test results of Flame Retardants

Sample Name	Soaping agent	Antifoaming agent	Wet crocking fastness agent	Anti-wrinkle power	Oil Remover	Dye-fixing Agent
Sample weight(g)	0.105	0.109	0.102	0.109	0.103	0.101
AP/APEO	ND	ND	ND	ND	ND	ND
Note: ND = Not Detected (< 10mg/kg)						

Table 4: Test results of auxiliary chemicals

4C / PROJECT STEP: CORRECTIVE ACTION PLAN

A corrective action plan (CAP) regarding the areas for improvement identified in the audit and water test was agreed between REWE, the dyeing mill and the service provider. Most findings were closed within 3 months. The below are examples of implemented corrective actions:

1. Detected substances in waste water samples
   - Identify possible source of detected substances and eliminate these substances
   - Request chemical suppliers to provide related documents (i.e. MSDS, testing report, certificate, etc.) for each chemical
   - Screen through the chemicals and phase out those which cannot meet the MRSL requirements

2. Chemical Management System
   - Record and monitor the monthly usage of each chemical
   - Ensure secondary containers are in place for all chemicals
   - Ensure all dyestuffs and auxiliaries are stored properly
   - Ensure PPE, safety laboratory/factory eye wash bottles/stations, fire extinguishers are available in the dyeing mill
   - Assign a responsible person to be in charge of chemical management system and provide him/her with related training
   - Provide training for the person who is handling chemicals and related records

4D. PROJECT STEP: RE-AUDIT – CM AUDIT (1/2)

Chemical management (CM) re-audit was conducted in December 2016 to ensure the chemical management findings and the wastewater test findings in the CAP were closed. The result is good:

- All CAP activities were closed.
- The dyeing mill was found to have 0 critical, 2 major and 3 minor non-conformities from the re-audit. The following table shows major and minor findings as well as some examples of positive findings. The dyeing mill has been requested to further work on these findings. The REWE Group will provide support if required.

Positive Findings	Major and Minor Findings
The factory has taken ZDHC MRSL into their chemical management policy. This policy covers all the dyestuff and auxiliaries.	The facility has not a chemical risk assessment used in the production and wastewater treatment. (Major)
The facility has a chemical inventory with supplier information. And the facility has a positive supplier list including raw material and chemicals.	The records have no photo relating to chemical training and no sufficient assessment after training. (Major)
The facility has the annual usage (volume) of each chemical monitoring and recording documents.	The facility has not formalized and implemented a formal Chemical Management Program with a written Chemical Management Plan (CMP). (Minor)
Complete and updated SDS for every single chemical is available.	The facility has not set goals for chemical management program. (Minor)
The facility assigned a staff to analyze the water test report and trace their chemicals use to identify the source of restricted substance.	No phase-out or replacement plan for the restricted substance(s) concerned, with clear targets and timeline. (Minor)

4D / PROJECT STEP: RE-AUDIT – WATER TESTING (2/2)

- Another water test has been part of the re-audit. Water samples were collected and tested at each process step from inlet water to wastewater after pretreatment, wastewater after dyeing, wastewater after soaping, wastewater after printing, etc.
- The samples were tested for the 11 Priority Chemical Groups.
- Only trace amounts of heavy metals were detected from inlet water and wastewater before treatment (See Table 1).
- The test results demonstrate the factory's good performance and that it is striving for continuous improvement in both chemicals and wastewater treatment process knowledge.
- The other 10 Priority Chemical Groups have not been detected in the wastewater samples (See Table 2).

Heavy Metals	I001	I002
As	ND	0.009 (Progressive)
Cd	ND	0.0002 (Aspirational)
Hg	ND	0.00026 (Aspirational)
Pb	ND	0.010 (Aspirational)
Sb	ND	0.004 (Aspirational)
Co	ND	ND
Ni	0.002 (Aspirational)	0.004 (Aspirational)
Cu	0.018 (Aspirational)	0.029 (Aspirational)
Zn	0.002 (Aspirational)	0.044 (Aspirational)
Cr	ND	ND
Mn	0.006	0.038
Cr VI	ND	ND
CN^-	ND	ND

Table 1. Test results of heavy metals
I001: Inlet water
I002: Wastewater before treatment

11 Priority Chemical Groups	I001	I002
Phthalates	o	o
Brominated and Chlorinated Flame Retardants	o	o
Azo Dyes	o	o
Organotin Compounds	o	o
Chlorobenzenes	o	o
Chlorinated Solvents	o	o
Chlorophenols	o	o
Short-Chained Chlorinated Paraffins	o	o
Heavy Metals	•	•
APs and APEOs	o	o
Perfluorinated Chemicals	o	o

Table 2. Test results of 11 Priority Chemical Groups

Note / Key :
- • Detected
- o – Not Detected

5 / SUMMARY

This case study has shown that the project enabled the dyeing mill to improve and strengthen their own chemical management system. The project approach, including chemical management audit and water testing, corrective action plan, training and re-audit allows the dyeing mill to keep track on their chemical management performance and improve their system in the long run.

Through chemical management audit and water testing, the dyeing mill has increased their understanding of chemical compliance management. The full audit helped in the identification of the problems in their chemical management system and the corrective action plan (CAP) allowed the dyeing mill to identify solutions to address the problems. The dyeing mill has successfully closed all findings before the re-audit and has shown great improvement from the re-test results.

Main Challenges:
The factory lacks experience and certain chemistry knowledge to implement corrective actions suggested by the service provider. A CAP should be established not only to provide guidance but also to estimate the resources and time needed for recommended improvements. Insufficient communication between the service provider and factory at the early stages of the project also delayed the completion of corrective actions.

Outlook:
According to the re-audit results, the factory has adopted a number of good practices which enable them to continue its efforts to improve chemical management in the future. Of course, there is still room for the factory to improve and REWE Group will support the factory accordingly. The factory can request another Chemical Management audit in the near future to receive additional guidance on achieving Detox compliance.

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