



H&M group Discharge Analysis 2017



Introduction

Sustainable production processes are an important part of our 100% circular ambition. H&M group's chemical management vision is to lead the change towards safe products and a toxic free fashion future. Our main focus is controlling the chemical input in the manufacturing process. We are committed to eliminate the use, and hence achieve zero discharge of hazardous chemicals by 2020.

Since 2012, H&M has been monitoring the chemical discharge situation of factories in different countries. In the study, 11 priority chemical groups (256 analytes) and heavy metals are tested in incoming water and treated wastewater (with some facilities also reporting additional raw wastewater and sludge). Discharge result is disclosed in publicly accessible platform , the Institute of Public and Environmental Affairs (IPE), www.ipe.org.cn.

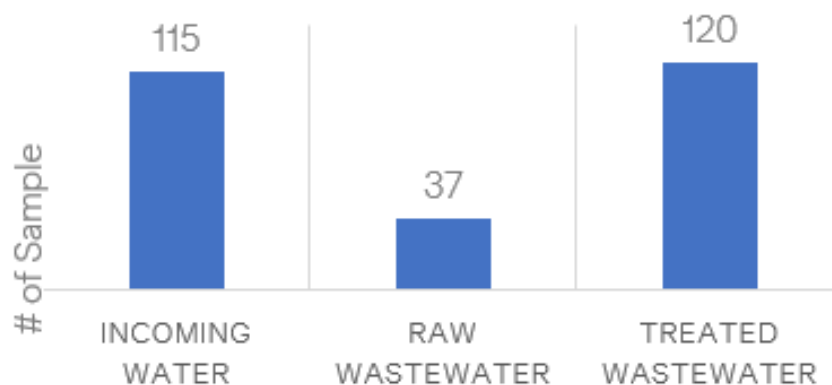


Methodology

Sample collection
by ZDHC
Approved Labs

Measurement were
performed on 11 Priority
Chemical Groups and
heavy metals by the
respective labs

Reports are issued
and published on
IPE Platform



In 2017, ZDHC Wastewater Guideline 2016 was not fully implemented and hence explains this inconsistency where there are different numbers of samples for each incoming water, raw wastewater, and treated wastewater. Sampling points arrangement was hence determined by individual labs and therefore not uniform. For all of the tested units, at least one type of wastewater was sampled and tested.

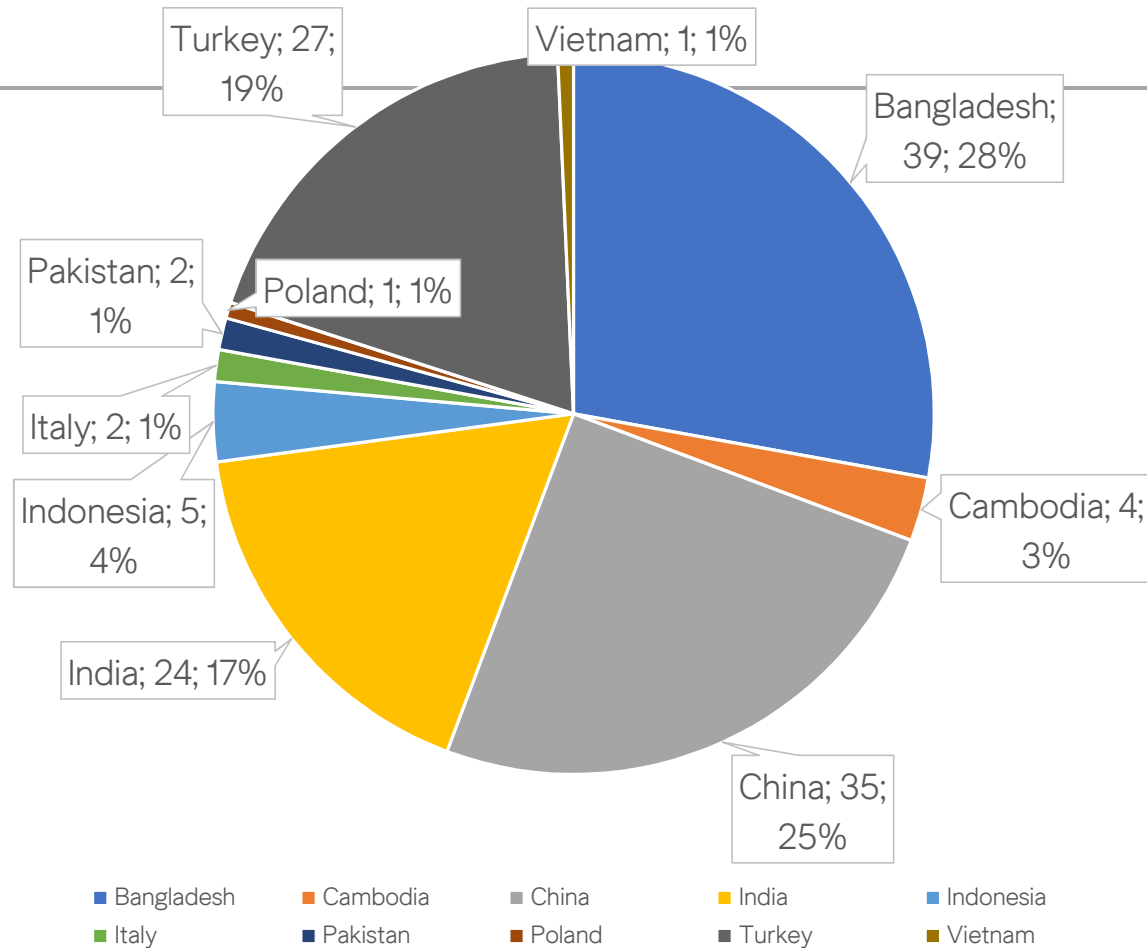
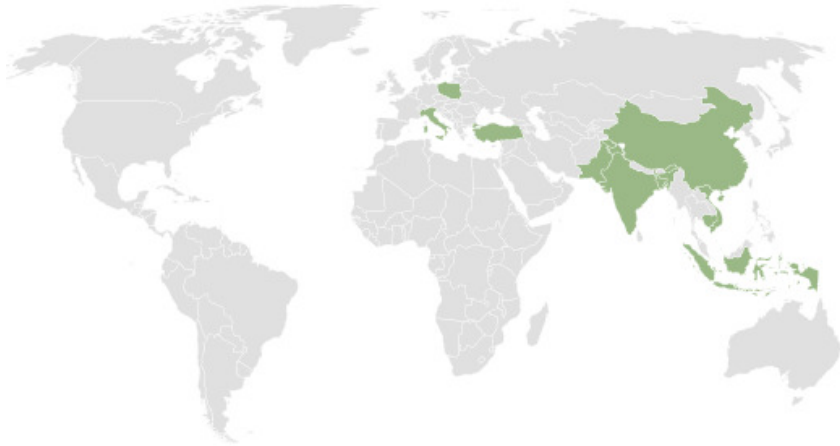
11 (9+2) Priority Chemical Groups were analyzed:

1. Phthalates
2. Flame Retardants
3. Amines (Azo dyes)
4. Organotin Compounds
5. Chlorobenzenes
6. Chlorotoluene
7. Chlorinated Solvents
8. Chlorophenols
9. SCCP
10. AP & APEOs
11. PFCs

and
Heavy Metals

Samples Demography

We tested across our production supply chain in Asia and Europe, covering **10** production countries out of 38 production countries (26.3%)



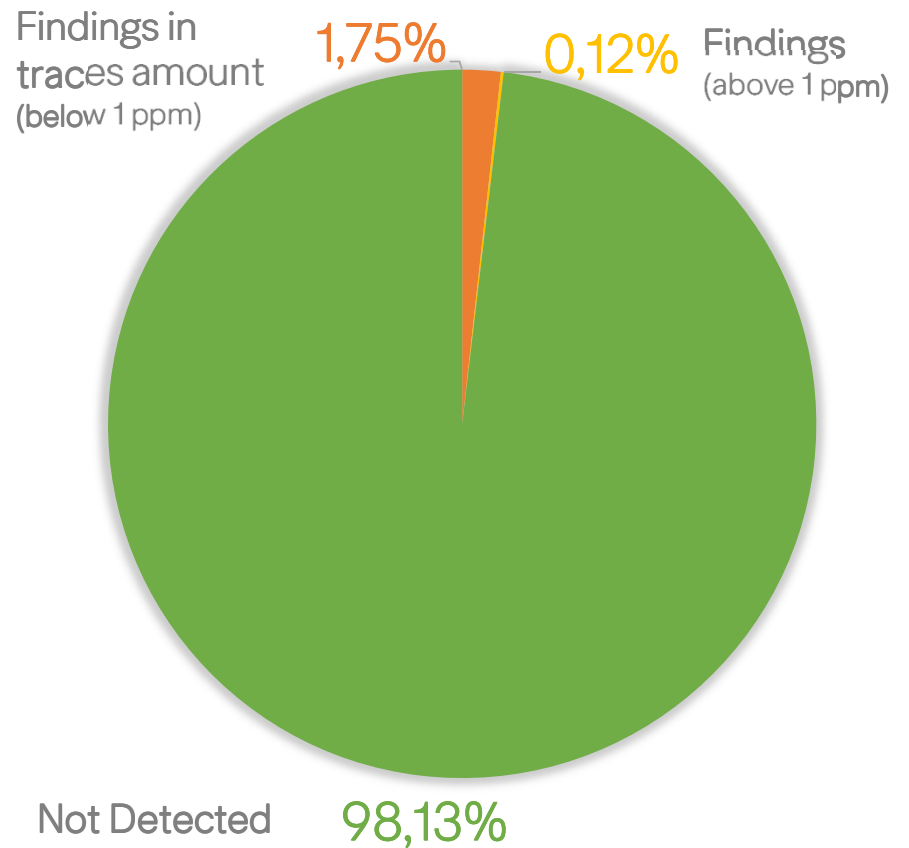
Result Overview

Data collected globally in 2017 from

140 facilities (19.3% of scope)

Analyses were performed on incoming water, raw wastewater and treated wastewater using the

Detox 9+2.



Result Overview



INCOMING WATERS

29 analytes found out of 226 tested analytes.

These 29 analytes belongs to all 11 Chemical Priority Groups and Heavy Metals.

RAW WASTEWATERS

45 analytes found out of 226 tested analytes.

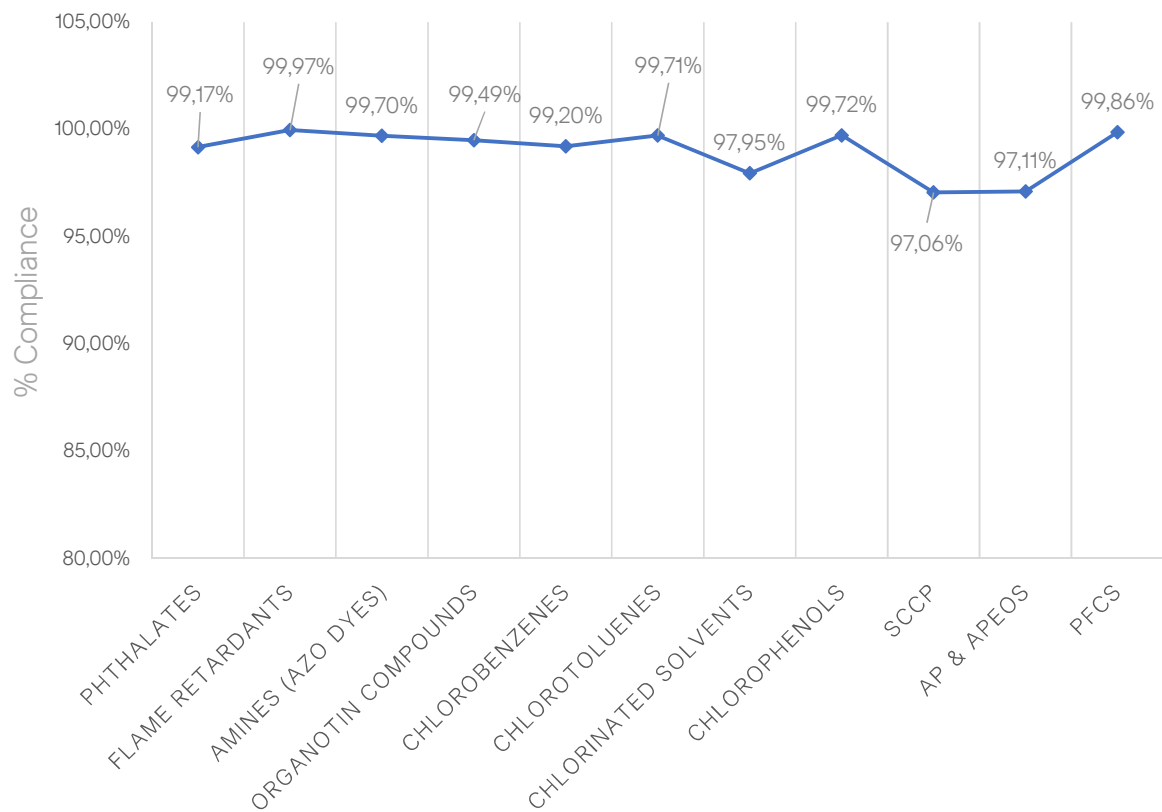
These 45 analytes belongs to all 11 Chemical Priority Groups and Heavy Metals.

TREATED WASTEWATERS

53 analytes found out of 226 tested analytes.

These 53 analytes belongs to all Chemical Priority Groups and Heavy Metals, except for Flame Retardants.

Compliance to ZDHC Standards (11 Chemical Groups)



Compliance Overview Data

This graph represented the overall result from all types of samples including incoming water, raw wastewater, and treated wastewater.

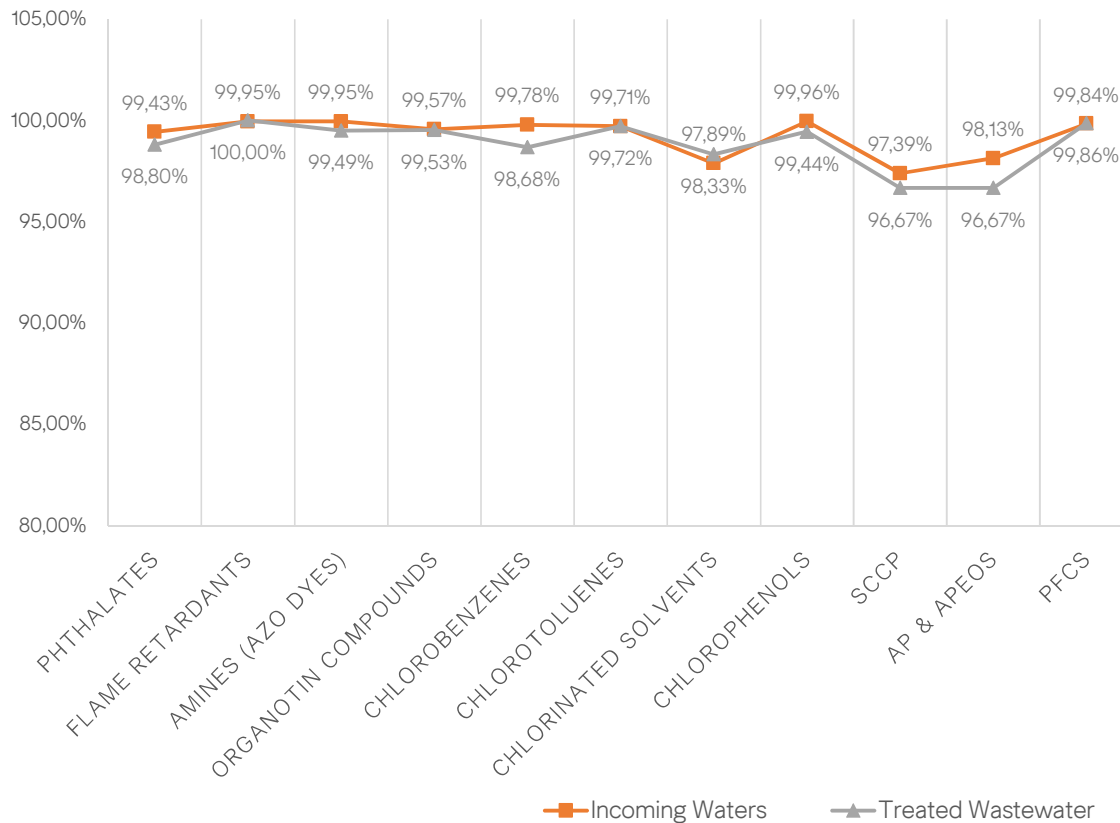
Compliance was measured against ZDHC Wastewater Guideline 2016. Percent compliance is the percentage of samples that are compliant with the standard.

From this data, it can be suggested that SCCP, AP&APEOs, and Chlorinated Solvents are the bottom 3 chemical groups in terms of compliance.

Next, we will analyze if this low compliance was seen in the treated wastewater that was discharged into the environment,

as well as if the incoming water had affected the quality.

Compliance to ZDHC Standards (11 Chemical Groups)



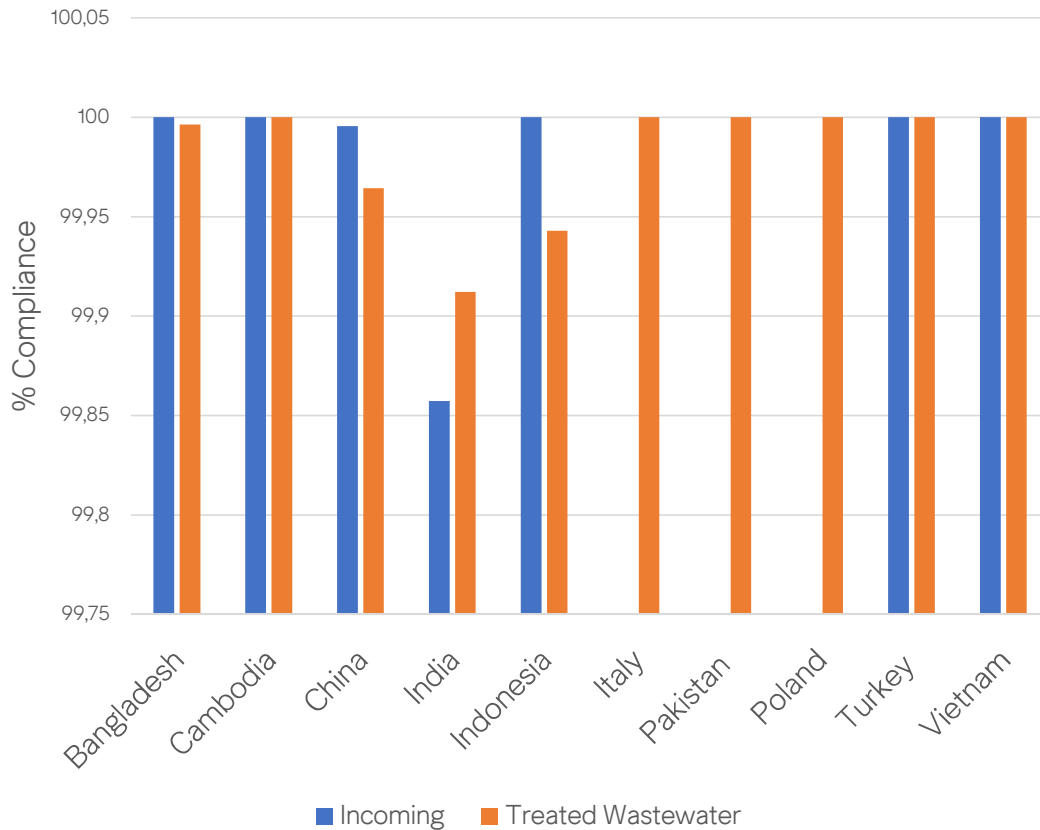
Comparison of Compliance for Incoming Water and Treated Wastewater

From this result, we concluded that incoming waters were contaminated in most parts which then contributed to the findings against ZDHC standards. SCCP was shown to have low compliance for both Incoming and Treated Wastewaters, suggesting that Incoming Water is responsible for the low performance. Even more, in Flame Retardants, the compliance of Incoming Waters (99.95%) were lower than Treated Wastewaters (100%)

Chlorobenzene and APEO were seen as the biggest differences in compliance between Incoming Water and Treated Wastewater, suggesting the use of Chlorobenzene and APEO in production process. However, it is worth noting that APEO was already detected in Incoming Waters which shows that the APEO in Treated Wastewaters could be caused by the existing levels in Incoming Waters.

We will then analyze in greater details regarding the findings of Chlorobenzenes and APEO in the production regions in the next section.

AP & APEOs by Regions

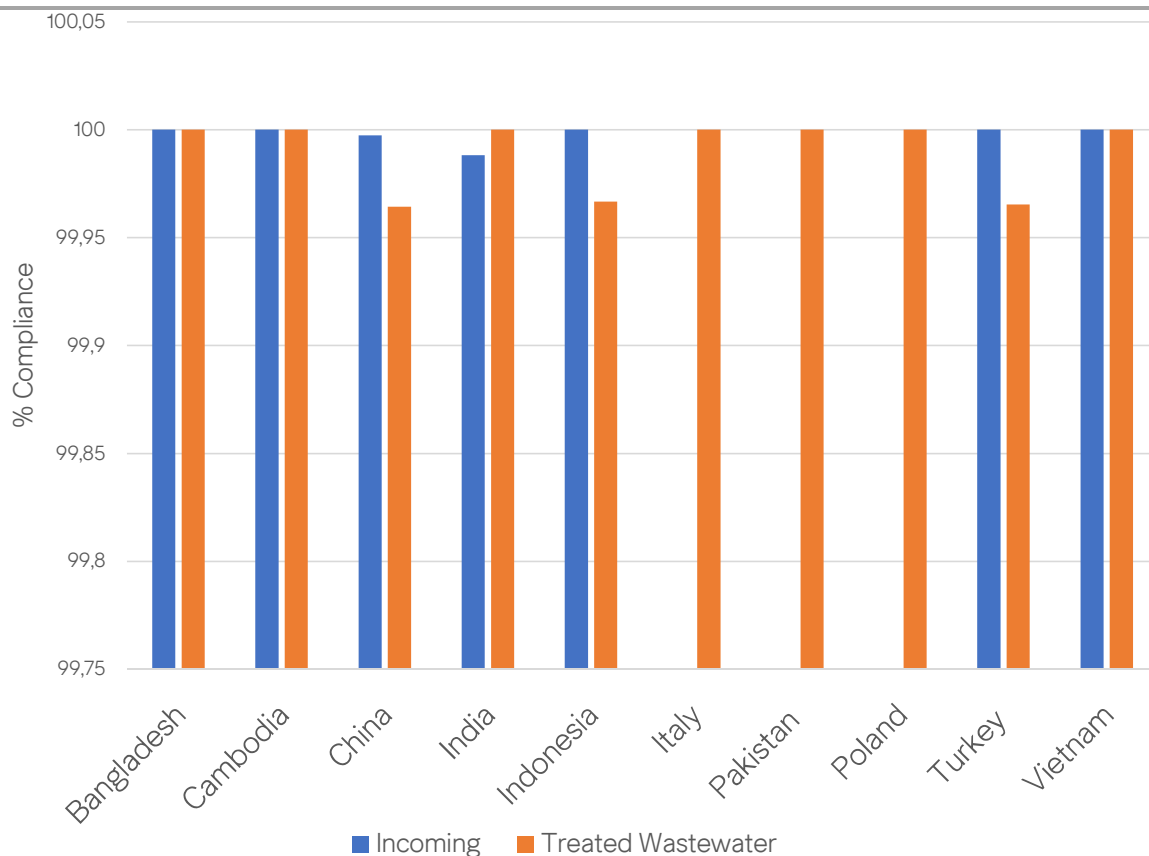


In India, OP1EO, NP, NPEO and NP1EO were found in both incoming and treated wastewater in similar levels ranging 0.002 to 0.019 ppm.

While the most significant levels were found in China for Nonylphenol (0.067 ppm), NPEO (0.0076 ppm) and NP1EO (0.025 ppm).

APEO has been classified as usage ban within H&M supply chain, therefore findings in traces amount should be due to impurities or lack of transparency in chemical information from the chemical manufacturer.

Chlorobenzene by Regions

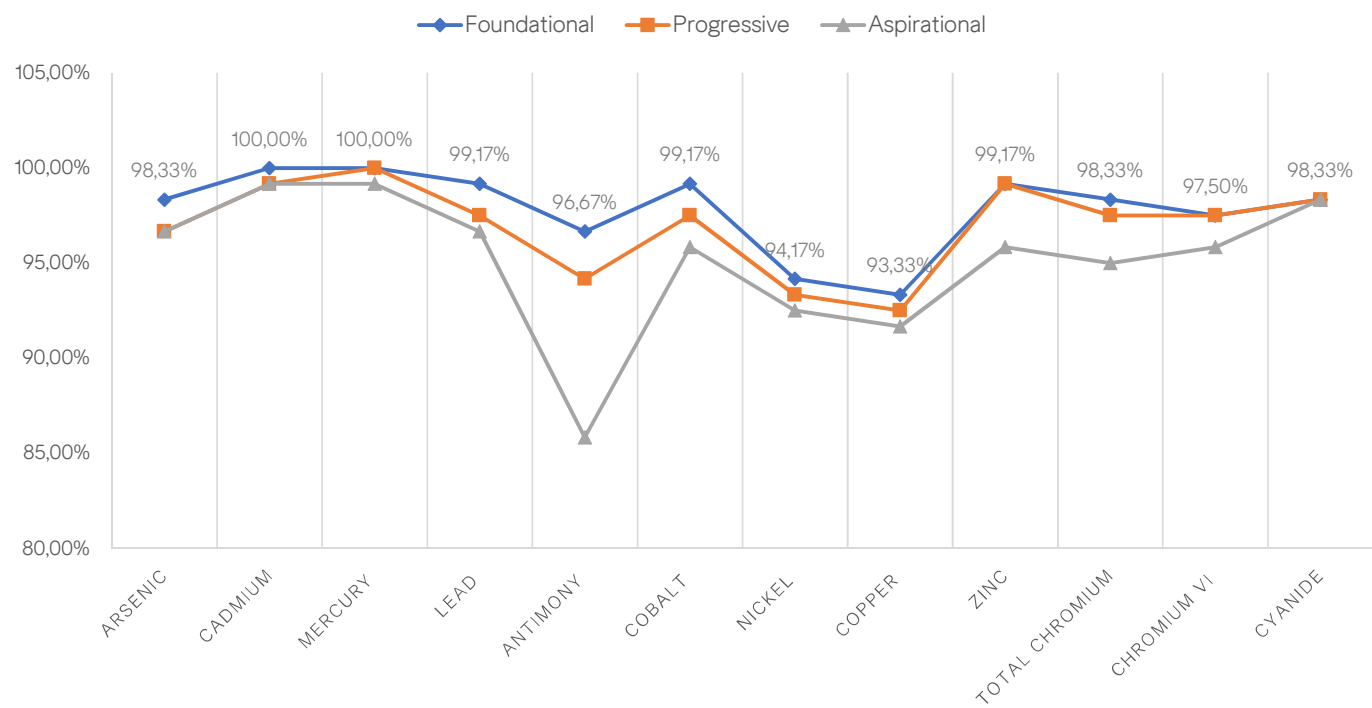


Chlorobenzenes was widely found in Treated Wastewaters of China, Indonesia and Turkey (most of them in the range of 0.0001 to 0.019 ppm for Chlorobenzene, Dichlorobenzenes and Trichlorobenzenes).

The highest finding was found in Indonesia for Chlorobenzene (24.8 ppm). The facility has conducted analysis but found difficulties in determining the root cause of this finding since it is a light-performing washing facility with no use for chemicals with chlorobenzenes.

The facility has also conducted a re-test for Chlorobenzene with Not Detected as the result.

Compliance to ZDHC Standards for Heavy Metals



Heavy Metals Compliance Data from Treated Wastewaters

Only Cadmium and Mercury are at 100% compliance for the Foundational levels.

There are many factors that leads to incompliance in Heavy Metals, and most of them are uncontrollable factors such as Incoming Waters and the plumbing system. For the usage of chemicals, we also find that Antimony is difficult to control as it is one of the raw material in polyester manufacturing.

H&M Actions

In the fashion and design industry, water and chemicals are involved in most of the largest production processes. The below actions are our ways of addressing our chemical management, which is crucial to achieving sustainable production and our 100% Circular & Renewable ambition.

- Secure the technical competence level in our supply chain by conducting various capacity building programs
- Work closely with our suppliers to develop good chemical management systems with Best Chemical Management Practice (BCMP)
- Continuously improve Environmental Emission Evaluator (E3) measurement tool within industry with Bureau Veritas to evaluate chemical input management
- Enhance collaboration with other brands and the chemical industry to find best available chemicals (Positive Lists) based on Screened Chemistry, a hazard based approach
- Implement the substitution of hazardous chemicals by promoting and publishing the lists of best available chemicals (Positive Lists) in our supplier portal and company websites
- Keep our Manufacturing Restricted Substances List (MRSL) up-to-date with the latest scientific data for Leading the Change in developing clean production, while being aligned with the industry (with 9+2 Priority Chemicals as a minimum)
- Implement a new chemical roadmap and goal to reach 100% traceability of input chemicals in production by 2030

Appendix A : Sampling Standard Procedures

1. US EPA Guidelines – Regulatory monitoring and testing Water and wastewater sampling
2. Australia EPA (Victoria) Guideline – Sampling and Analysis of Waters, Wastewaters, Soils and Wastes.
3. ISO 5667-3, Water Quality – Sampling – Part 3: Guidance on the preservation and handling of water samples
4. ASTM D3976-92 (Reapproved 2010) – Standard Practice for preparation of Sediment Samples for Chemical Analysis

Appendix B : Measured Analytes

No	Chemical Group	Chemical Name	CAS #	No	Chemical Group	Chemical Name	CAS #
1	Phthalate	Butyl benzyl phthalate (BBP)	85-68-7	24	Flame Retardants	Polybrominated biphenyls (PBBs)	various
2		Dibutyl phthalate (DBP)	84-74-2	25		Monobromo biphenyls (MonoBB)	-
3		Di(2-Ethyl Hexyl) Phthalate (DEHP)	117-81-7	26		Dibromo biphenyls (DiBB)	-
4		Di-n-octyl phthalate (DNOP)	117-84-0	27		Tribromo biphenyls (TriBB)	-
5		Di-iso-nonyl phthalate (DINP)	28553-12-0	28		Tetrabromo biphenyls (TetraBB)	-
6		Di-iso-decyl phthalate (DIDP)	26761-40-0	29		Pentabromo biphenyls (PentaBB)	-
7		Di Methyl Phthalate DMP	131-11-3	30		Hexabromo biphenyls (HexaBB)	-
8		Diethyl phthalate (DEP)	84-66-2	31		Heptabromo biphenyls (HeptaBB)	-
9		Di-n-propyl phthalate (DPRP)	131-16-8	32		Octabromo biphenyls (OctaBB)	-
10		Di-Iso-Butyl Phthalate (DIBP)	84-69-5	33		Nonabromo biphenyls (NonaBB)	-
11		Di-cyclohexyl phthalate (DCHP)	84-61-7	34		Decabromo biphenyl (DecaBB)	13654-09-6
12		Di-n-hexyl phthalate (DnHP)	84-75-3	35		Polybrominated diphenyl ethers (PBDEs)	various
13		Dinonyl phthalate (DNP)	84-76-4	36		Monobromo diphenyl ethers (MonoBDE)	-
14		Di-iso-octyl phthalate (DIOP)	27554-26-3	37		Dibromo diphenyl ethers (DiBDE)	-
15		Dimethoxyethyl phthalate (DMEP)	117-82-8	38		Tribromo diphenyl ethers (TriBDE)	-
16		1,2-Benzenedicarboxylic acid, di-C6-8-branched alkyl esters, C7-rich (DIHP)	71888-89-6	39		Tetrabromo diphenyl ethers (TetraBDE)	40088-47-9
17		1,2-Benzenedicarboxylic acid, di-C7-11 branched and linear alkyl esters (DHNUP)	68515-42-4	40		Pentabromo diphenyl ethers (PentaBDE)	32534-81-9
18		Butyl octyl phthalate (BOP)	84-78-6	41		Hexabromo diphenyl ethers (HexaBDE)	36483-60-0
19		Diundecyl phthalate (DUP)	3648-20-2	42		Heptabromo diphenyl ethers (HeptaBDE)	68928-80-3
20		Bis(2-ethoxyethyl) phthalate (BEEP)	605-54-9	43		Octabromo diphenyl ethers (OctaBDE)	32536-52-0
21		Di-iso-pentyl phthalates (DiIPP)	605-50-5	44		Nonabromo diphenyl ethers (NonaBDE)	63936-56-1
22		n-Pentyl iso-pentyl phthalate (PIPP)	776297-69-9	45		Decabromo diphenyl ether (DecaBDE)	1163-19-5
23		Di-n-pentyl phthalate (DnPP)	131-18-0	46		Tris(2,3-Dibromopropyl)-Phosphate (TRIS)	126-72-7
			47	Tetrabromo-bisphenol A (TBBPA)		79-94-7	
			48	Bis(2,3-dibromopropyl) phosphate		5412-25-9	
						134237-50-6, 134237-51-7, 134237-52-8, 25637-99-4, 3194-55-6	
			49	Hexabromocyclododecane (HBCDD)		3194-55-6	
			50	2,2-Bis(bromomethyl)-1,3-propanediol (BBMP)		3296-90-0	
			51	Tetrabromobisphenol A bis(2,3-dibromopropyl ether) (TBBPA-DBPE)		21850-44-2	
			52	Tris(1,3-dichloro-isopropyl) phosphate (TDCPP)		13674-87-8	
			53	Tris(2-chloroethyl)Phosphate (TCEP)		115-96-8	
			54	Tri(1-chloro-2-propyl) phosphate (TCPP)		13674-84-5	
			55	Tris-(aziridinyl)-phosphineoxide (TEPA)		545-55-1	
			56	Tri-o-cresyl-phosphate		78-30-8	
			57	Triphenyl phosphate (TPhP)		115-86-6	

Appendix B : Measured Analytes

No	Chemical Group	Chemical Name	CAS #	
58	Amines (Azo Dyes)	4-Aminodiphenyl (Biphenyl-4-ylamine or Xenylamine)	92-67-1	
59		Benzidine	92-87-5	
60		4-Chloro-o-toluidine	95-69-2	
61		2-Naphthylamine	91-59-8	
62		o-Aminoazotoluene (4-Amino-2',3'-dimethylazobenzene or 4-o-tolyazo-o-toluidine)	97-56-3	
63		5-nitro-o-toluidine (2-Amino-4-nitrotoluene)	99-55-8	
64		4-Chloroaniline (p-Chloroaniline)	106-47-8	
65		4-Methoxy-m-phenylenediamine (2,4-Diaminoanisole)	615-05-4	
66		4,4' -Diaminodiphenylmethane (4,4' -Methylenedianiline)	101-77-9	
67		3,3' -Dichlorobenzidine (3,3' -Dichlorobiphenyl-4,4' -ylenediamine)	91-94-1	
68		3,3' -Dimethoxybenzidine (o-Dianisidine)	119-90-4	
69		3,3' -Dimethylbenzidine (4,4' -Bi-o-tolidine)	119-93-7	
70		4,4' -Methylenedi-o-toluidine (3,3' -Dimethyl-4,4' -diaminodiphenylmethane)	838-88-0	
71		p-Cresidine (6-Methoxy-m-toluidine)	120-71-8	
72		4,4' -Methylene-bis-(2-chloroaniline) (2,2' -Dichloro-4,4' -methylene-dianiline)	101-14-4	
73		4,4-Oxydianiline	101-80-4	
74		4,4-Thiodianiline	139-65-1	
75		Amines (Azo Dyes)	o-Toluidine (2-Aminotoluene)	95-53-4
76			4-Methyl-m-phenylenediamine (2,4-Toluenediamine)	95-80-7
77			2,4,5-Trimethylaniline	137-17-7
78			o-Anisidine (2-Methoxyaniline)	90-04-0
79			4-Aminoazobenzene (p-Aminoazobenzene)	60-09-3
80			2,4-Xylidine (2,4-dimethylaniline)	95-68-1
81			2,6-Xylidine (2,6-dimethylaniline)	87-62-7
82	Aniline		62-53-3	
83	1,4-Phenylenediamine		106-50-3	
84	2-Chloroaniline		95-51-2	
85	5-Nitro-o-anisidine		99-59-2	
86	m-Toluidine		108-44-1	
87	N,N-Diethylaniline		91-66-7	
88	N-Ethylaniline		103-69-5	
89	N-Methylaniline		100-61-8	
90	p-Toluidine		106-49-0	

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No	Chemical Group	Chemical Name	CAS #	No	Chemical Group	Chemical Name	CAS #
91	Organotin Compounds	Monobutyltin (MBT)	Various	119	Chlorotoluene	2-Chlorotoluene	95-49-8
		Dibutyltin (DBT)/		120		3-Chlorotoluene	108-41-8
92		Dibutyltin chloride (DBTC)	Various	121		4-Chlorotoluene	106-43-4
		Tributyltin (TBT)/		122		2,3-Dichlorotoluene	32768-54-0
		Bis(Tributyltin) oxide (TBTO)		123		3,4-Dichlorotoluene	95-75-0
93			Various	124		2,4-Dichlorotoluene	95-73-8
94		Tetrabutyltin (TebT)	1461-25-2	125		2,5-Dichlorotoluene	19398-61-9
95		Monooctyltin (MOT)	Various	126		2,6-Dichlorotoluene	118-69-4
96		Dioctyltin (DOT)	Various	127		2,3,6-Trichlorotoluene	2077-46-5
97		Trioctyltin (TOT)	Various	128		2,4,5-Trichlorotoluene	6639-30-1
98		Tripopyltin (TPT)	Various	129		Benzotrichloride	98-07-7
99		Diphenyltin (DPHT)	Various	130		alpha,2,6-trichlorotoluene	2014-83-7
100		Triphenyltin (TPHT)	Various	131		alpha,2,4-trichlorotoluene	94-99-5
101		Dimethyltin (DMeT)	Various	132		alpha,3,4-trichlorotoluene	102-47-6
102		Trimethyltin (TMeT)	Various	133		alpha,alpha,alpha-2-Tetrachlorotoluene	2136-89-2
103		Triethyltin (TET)/ Tetraethyltin (TeET)	597-64-8	134		alpha,alpha,alpha-4-Tetrachlorotoluene	5216-25-1
104		Tricyclohexyltin (TCyHT)	Various	135		alpha,alpha,2-6-Tetrachlorotoluene	81-19-6
105		Other tri-substituted organotins	Various	136		Pentachlorotoluene	877-11-2
106	Dibutyltin hydrogen borate (DBB)	75113-37-0	137	1,2-Dichloroethane	107-06-2		
107	Chlorobenzene	Chlorobenzene	108-90-7	138	Chlorinated Solvents	1,1-Dichloroethylene	75-35-4
108		1,2-Dichlorobenzene	95-50-1	139		Methylene Chloride	75-09-2
109		1,3-Dichlorobenzene	541-73-1	140		cis-1,2-Dichloroethylene	156-59-2
110		1,4-Dichlorobenzene	106-46-7	141		trans-1,2-Dichloroethylene	156-60-5
111		1,2,3-Trichlorobenzene	87-61-6	142		Chloroform	67-66-3
112		1,2,4-Trichlorobenzene	120-82-1	143		1,1,1-Trichloroethane	71-55-6
113		1,3,5-Trichlorobenzene	108-70-3	144		Carbon Tetrachloride	56-23-5
114		1,2,3,4-Tetrachlorobenzene	634-66-2	145		Trichloroethylene	79-01-6
115		1,2,3,5-Tetrachlorobenzene	634-90-2	146		1,1,2-Trichloroethane	79-00-5
116		1,2,4,5-Tetrachlorobenzene	95-94-3	147		1,1,1,2-Tetrachloroethane	630-20-6
117		Pentachlorobenzene	608-93-5	148		Tetrachloroethylene	127-18-4
118		Hexachlorobenzene	118-74-1	149		1,1-Dichloroethane	75-34-3
			150	1,1,2,2-Tetrachloroethane	79-34-5		

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No	Chemical Group	Chemical Name	CAS #
151		Pentachlorophenol (PCP)	87-86-5
152		2,3,4,5-Tetrachlorophenol	4901-51-3
153		2,3,4,6-Tetrachlorophenol	58-90-2
154		2,3,5,6-Tetrachlorophenol	935-95-5
155		2,4,6-Trichlorophenol	88-06-2
156		2,3,5-Trichlorophenol	933-78-8
157		2,3,6-Trichlorophenol	933-75-5
158		2,4,5-Trichlorophenol	95-95-4
159		2,3,4-Trichlorophenol	15950-66-0
160		3,4,5-Trichlorophenol	609-19-8
161	Chlorophenol	2,3-Dichlorophenol	576-24-9
162		2,4-Dichlorophenol	120-83-2
163		2,5-Dichlorophenol	583-78-8
164		2,6-Dichlorophenol	87-65-0
165		3, 5-dichlorophenol	591-35-5
166		3,4-Dichlorophenol	95-77-2
167		2-Chlorophenol	95-57-8
168		3-Chlorophenol	108-43-0
169		4-Chlorophenol	106-48-9
170		o-Phenylphenol	90-43-7
171		4-Chloro-3-methylphenol	59-50-7
172	SCCP	SCCP C 10-13	85535-84-8

No	Chemical Group	Chemical Name	CAS #
173	AP & APEOs	Octylphenol (OP)	Various (140-66-9, 27193-28-8, 1806-26-4)
174		Octylphenol monoethoxylates (OP1EO)	51437-89-9
175		Octylphenoethoxylates, (n=2 to n=16)	Various (9002-93-1, 9036-19-5, 68987-90-6)
176		Nonylphenol (NP)	Various (25154-52-3, 104-40-5, 90481-04-2, 84852-15-3, 1173019-62-9)
177		Nonylphenol Ethoxylates NPEO	-
178		Nonylphenol monoethoxylates (NP1EO)	104-35-8
179		Nonylphenoethoxylates, (n=2 to n=18)	Various (9016-45-9, 26027-38-3, 127087-87-0, 37205-87-1, 68412-54-4)
180		Arsenic (mg/L)	7440-38-2
181		Cadmium (mg/L)	7440-43-9
182		Mercury (mg/L)	7439-97-6
183	Lead (mg/L)	7439-92-1	
184	Antimony and antimony compounds (mg/L)	7440-36-0	
185	Cobalt and cobalt compounds (mg/L)	7440-48-4	
186	Nickel and nickel compounds (mg/L)	7440-02-0	
187	Heavy Metals	Copper (mg/L)	7440-50-8
188		Zinc (mg/L)	7440-66-6
189		Total Chromium (mg/L)	7440-47-3
190		Manganese (mg/L)	7439-96-5
191		Chromium VI (ug/L)	7440-41-7/ 1304-56-9
192		Cyanide (ug/L)	18540-29-9
193		Beryllium & beryllium oxide (ug/L)	Various (incl. 57-12-5)

information

Appendix B : Measured Analytes

No	Chemical Group	Chemical Name	CAS #
194	PFCs	Perfluorobutanesulfonic acid (PFBS)	375-73-5, 29420-49-3, 59933-66-3
195		Perfluorohexanesulfonic acid (PFHxS)	355-46-4, 3871-99-6
196		Perfluoro-1-heptanesulfonic acid (PFHpS)	375-92-8, 60270-55-5
197		Perfluorooctanesulfonic acid (PFOS)	1763-23-1, 56773-72-3, 307-35-7
198		Perfluorodecane sulfonic acid (PFDS)	335-77-3, 126105-34-8
199		Perfluorooctane Sulfonamide (PFOSA)	754-91-6
200		Perfluorobutyric Acid (PFBA)	375-22-4
201		Perfluoropentanoic Acid (PFPA)	2706-90-3
202		Perfluoro-n-hexanoic acid (PFHxA)	307-24-4
203		Perfluoro-n-heptanoic acid (PFHpA)	375-85-9
204		Perfluoro-n-octanoic acid (PFOA)	335-67-1
205		Perfluoro-n-nonanoic acid (PFNA)	375-95-1
206		Perfluoro-n-decanoic acid (PFDA)	335-76-2
207		Perfluoroundecanoic Acid (PFUnA)	2058-94-8, 4234-23-5
208		Perfluorododecanoic Acid (PFDoA)	307-55-1
209		Perfluorotridecanoic Acid (PFTrA)	72629-94-8
210		Perfluorotetradecanoic Acid (PFTeA)	376-06-7
211		Perfluoro-3,7-dimethyloctanoic acid (PF-3,7-DMOA)	172155-07-6
212		7H-Perfluoroheptanoic acid (HPFHpA)	1546-95-8
213		2H,2H-Perfluorodecanoic acid (H2PFDA)	-
214		2H,2H,3H,3H-Perfluoroundecanoic acid (PFUnA)	34598-33-9
215		1H,1H,2H,2H-Perfluorooctylacrylate (FTA 6-2)	17527-29-6
216		1H,1H,2H,2H-Perfluorodecylacrylate (FTA 8-2)	27905-45-9
217		1H,1H,2H,2H-Perfluorododecylacrylate (FTA 10-2)	17741-60-5
218		2-Perfluorobutylethanol (FTOH 4-2)	2043-47-2
219		2-Perfluorohexylethanol (FTOH 6-2)	647-42-7
220	2-Perfluorooctylethanol (FTOH 8-2)	678-39-7	
221	2-Perfluorodecylethanol (FTOH 10-2)	865-86-1	
222	2-(N-methylperfluoro-1-octanesulfonamido)-ethanol (N-MeFOSE)	24448-09-7	
223	2-(N-Ethylperfluoro-1-octanesulfonamido)-ethanol (N-EtFOSE)	1691-99-2	
224	N-Methylperfluoro-1-octanesulfonamide (N-MeFOSA)	31506-32-8	
225	N-Ethylperfluoro-1-octanesulfonamide (N-EtFOSA)	4151-50-2	
226	1H,1H,2H,2H-Perfluorooctanesulphonic acid (H4PFOS 6-2)	27619-97-2	