UNITED COLORS OF BENETTON.

Benetton Group srl

2023 Wastewater Analysis

Table of contents

Introduction

Textile industry is linked to water pollution due to the large use of chemicals in its production processes. All 'textile wet processing', that include dyeing, washing, printing and fabric finishing, lead to the discharge of large quantities of wastewater containing toxic substances, many of which are hazardous and persistent.
With the aim of "cleaning" the whole textile supply chain (i.e., clean factory approach), starting from 2013 Benetton collaborates with Greenpeace through the Detox Campaign[1] towards the complete elimination of hazardous chemicals from manufacturing and it has defined a Detox Programme Guideline, addressed to all its wet process suppliers.
In line with its Detox Commitment, Benetton Group joined two organizations: *Zero Discharge of Hazardous Chemicals* (ZDHC)[2] Group and Cascale[3], where international brands cooperate to improve the environmental performance of the supply chain and to develop methodologies to minimize and eliminate hazardous chemicals from textile production.
Tools and methodologies of both organizations, as for example ZDHC Wastewater Guideline and Higg Facility Environmental Module (Higg FEM), are included in the Benetton's Detox Programme Guideline.

ZDHC Wastewater Guideline was released at the end of 2016 but, even if Benetton started adopting it from 2017, only in the last three years it was possible to collect a significant sample of test results. This was mainly due to the fact that the release and the finalization of the ZDHC Gateway took some time, not only for technical issues but also to allow time for suppliers' awareness of the importance to test following a standardized protocol, as well as sharing their wastewater test results within a shared portal.
In particular, from the ZDHC Gateway – Wastewater Module, it is possible to download all test results in a common excel format and then compare and analyze all reported data.

The ZDHC Wastewater Guidelines define a single, unified standard for wastewater testing that goes beyond regulatory compliance and conventional wastewater testing parameters and results are accepted by all ZDHC brands. According to this document, chemicals to be tested in wastewater are divided into three macro-groups, that are MRSL, Heavy Metals and Conventional Parameters and Anions...

In this report, data of wastewater analysis performed by Benetton's suppliers, have been analyzed by considering data disclosed in the ZDHC Gateway – Wastewater Module during the 2023 year,

[1] Benetton's Detox Commitment: http://www.benettongroup.com/sites/all/temp/benetton_group_detox_commitment_1.pdf
[2] http://www.roadmaptozero.com/
[3] https://cascale.org/

2023 Wastewater Analysis

According to the data collected from the test reports published in the ZDHC Gateway – Wastewater Module during 2023, it emerges that 154 wet process suppliers working with Benetton and representing more than 80% in terms of volume (pcs produced by year), have performed wastewater analysis according to the ZDHC Wastewater Guideline.
As shown in Figure 1, around 67% of these plants are in Asia (mainly in Bangladesh, China and India) and 33% in the Mediterranean Area (mainly in Italy, Egypt and Turkey).

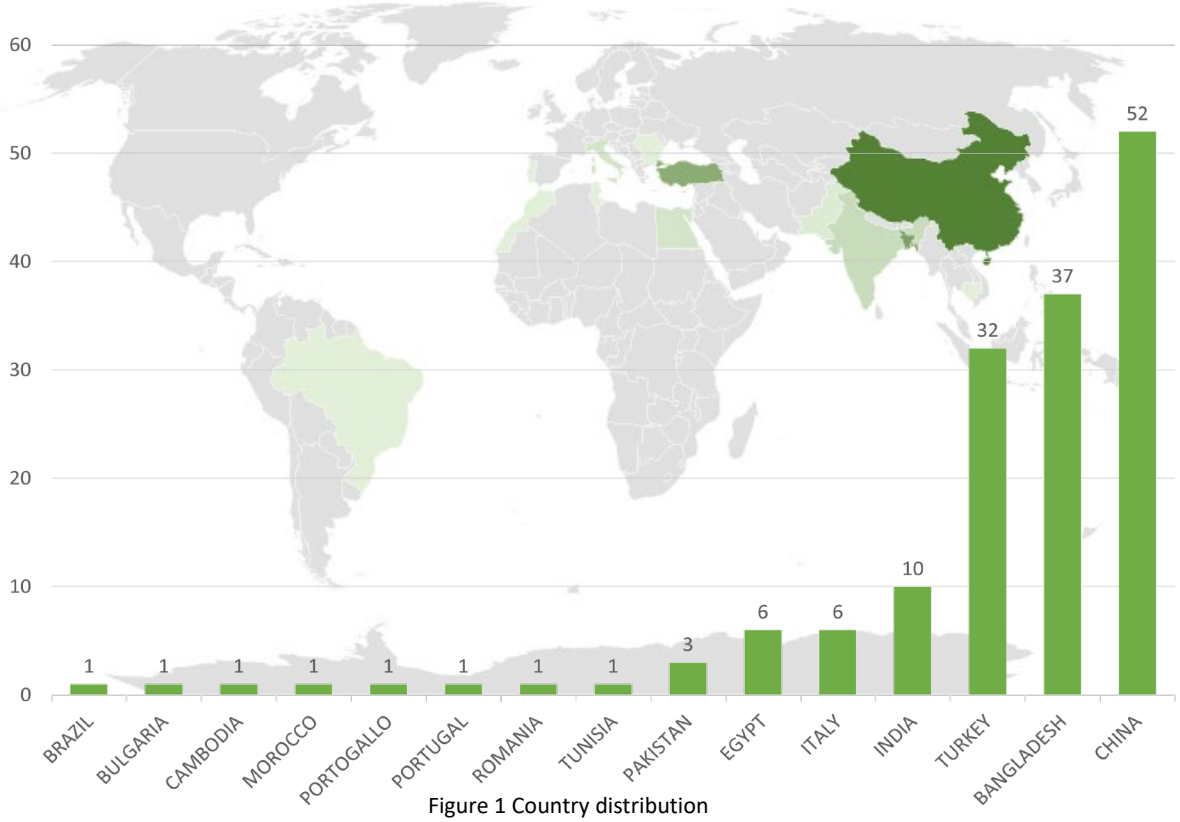

Figure 1 Country distribution

The collected data refer to facilities having different types of Effluent Treatment Plant (ETP) such as direct discharge (i.e., 60 facilities), indirect discharge (i.e., 87 facilities) and zero liquid discharge (i.e., 7 facilities). Some of them made only one test during the current year, some others more than one: this implies that is quite difficult to perform a good analysis since there is not an aligned set of data.

It is important to note that in the ZDHC Wastewater Guideline sampling and testing of Incoming Water is not a requirement since it could be part of the root cause analysis when there are non-conformities in the MRSL parameters' tests.

To have a better understanding of the chemical substances that is possible to find in discharged water of textile industries, we decided to perform the analysis by considering the classification of the chemical substances groups defined in the ZDHC Wastewater Guideline: MRSL Parameters, Heavy Metals, Anions and Conventional Parameters[4].

[4] We use "Conventional Parameters" to refer to the Sum Parameters defined in the Appendix A of the ZDHC Wastewater Guideline v.1.1. In the ZDHC document, in fact, Conventional Parameters include Sum Parameters, Anions and Heavy Metals.

1. MRSL Parameters

According to ZDHC Wastewater Guideline's classification, MRSL Parameters is constituted by the following Chemical Groups: AP/APEO, Anti-Microbials & Biocides, Chlorinated Parafins, Chlorobenzenes and Chlorotoluenes, Chlorophenols, N,N-di-methylformamide (DMFa), Dyes – Azo, Dyes – Carcinogenic, Dyes – Disperse, Dyes - Navy Blue Colourant, Flame Retardants, Glycols/Glycols Ethers, Halogenated Solvents, Organotin Compounds, Other/ Miscellaneous Chemicals, Perfluorinated and Polyfluorinated Chemicals (PFCs), Phthalates, Polycyclic Aromatic Hydrocarbons (PAHs), UV Absorbers, Volatile Organic Compounds (VOC). All these groups have been tested in the Raw Wastewater according to the methods described in the ZDHC WW Guideline[5].
In total, concerning MRSL parameters, 56,510 analytes have been tested and results show that only 400 (less than 1%) have been detected (both below and above ZDHC Limits).
Compliance is reported graphically in Figure 2. Therefore, we can conclude that, in general, facilities are very close to the total compliance of MRSL Parameters.

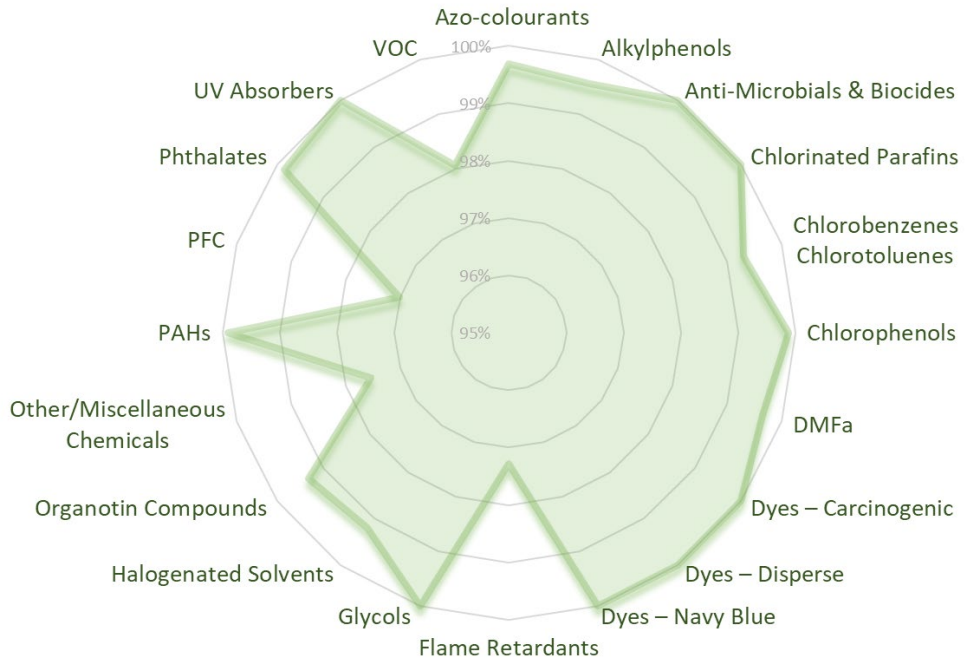

Figure 1 Compliance of ZDHC MRSL Parameters

Alkylphenols and Alkylphenols Ethoxylates (AP/APEO)

Among the 1,136 Alkylphenols and Alkylphenols Ethoxylates (AP/APEO) tested, only 5 have been detected and they exceed the ZDHC Limits (Figure 3).

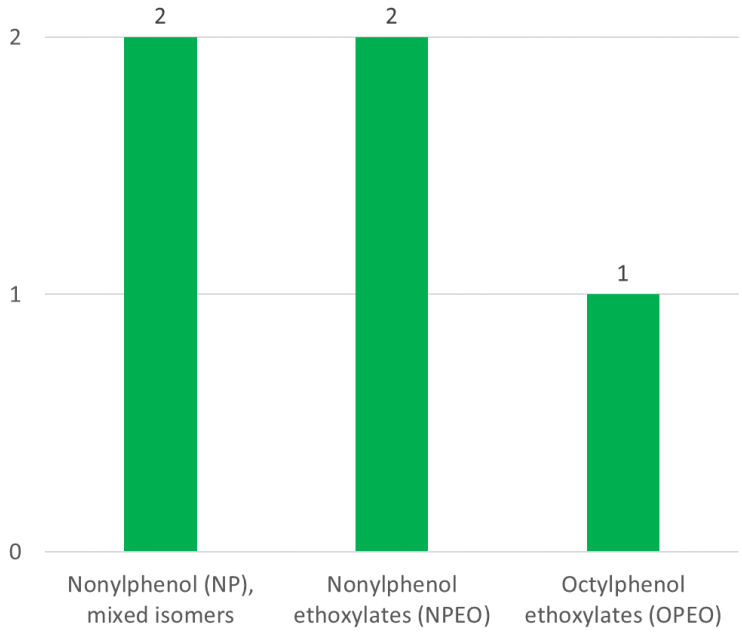

Figure 2 Number of AP/APEO detection

Chlorobenzenes and Chlorotoluenes

Chlorobenzenes and Chlorotoluenes have been detected in the Raw Wastewater of 4 different facilities, 3 with indirect discharge and one with direct discharge. In total, 568 analytes have been tested with a percentage of detection of 0.7% (Figure 4).

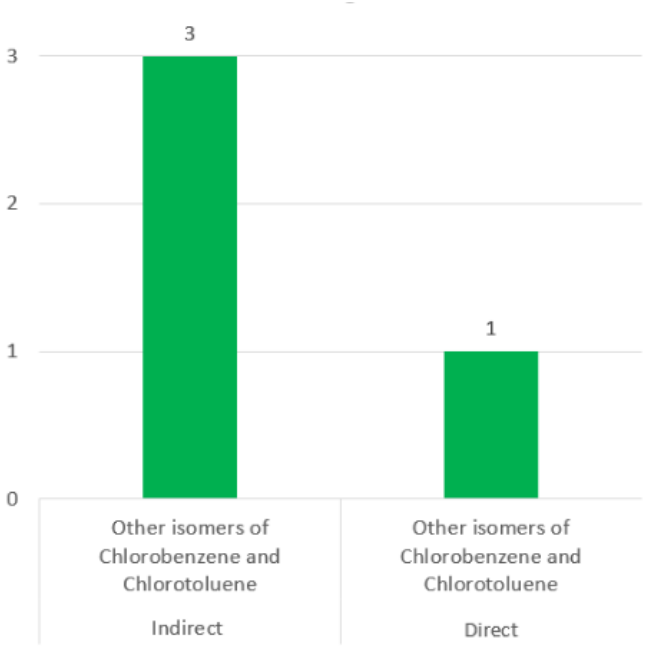

Figure 3 Number of Chlorobenzenes and Chlorotoluenes detections

Chlorophenols

The total number of tested Chlorophenols is 5,390 with 7 non-conformities, all above ZDHC limit. Since the total of analytes exceeding the ZDHC limit represents less than 0.13% non-conformities (figure 5), these detections are considered impurities (Figure 5).

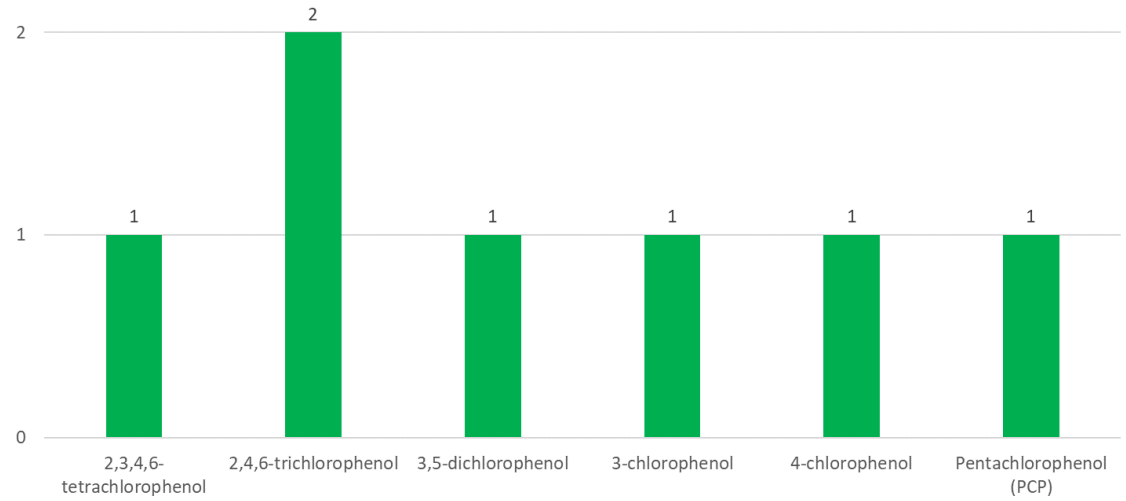

Figure 4 Number of Chlorophenols' detections

Dyes

Among 17,892 tests performed on Colorants, Azo Dyes (7,952 tested analytes) is the only substance group with detections. From results, in fact, there is not any detection of Dyes – Carcinogenic (4,260 tested analytes), Dyes – Disperse (5,112 tested analytes) and Dyes -Navy Blue Colourant (568 tested analytes).
Non-conformities of Azo-Dyes represent 0.31% on the total tested. Figure 6 shows detections in Raw wastewater: 4-chloroaniline is the substance with the highest number of detections (19) (Figure 6).

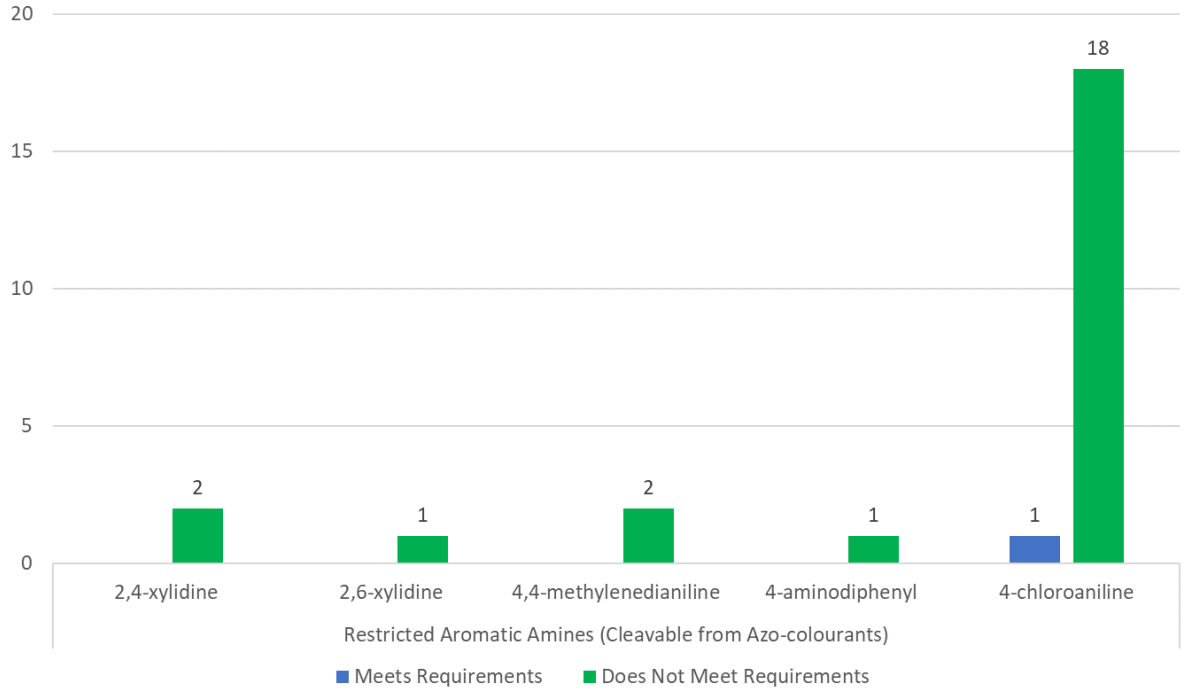

Figure 5 Number of Dyes-Azo detections

Flame Retardants

The total number of analytes tested is 8,520 with 232 detections. On average about 50 analytes were found for each substance analyzed out of a total of 154 tested plants (Figure 7). Boron is the common element in these substances. It's plausible that the high number of detections of flame retardants may be attributed to the fact that these substances can form or be present in wastewater treatment plants due to the presence of boron in the incoming natural water.

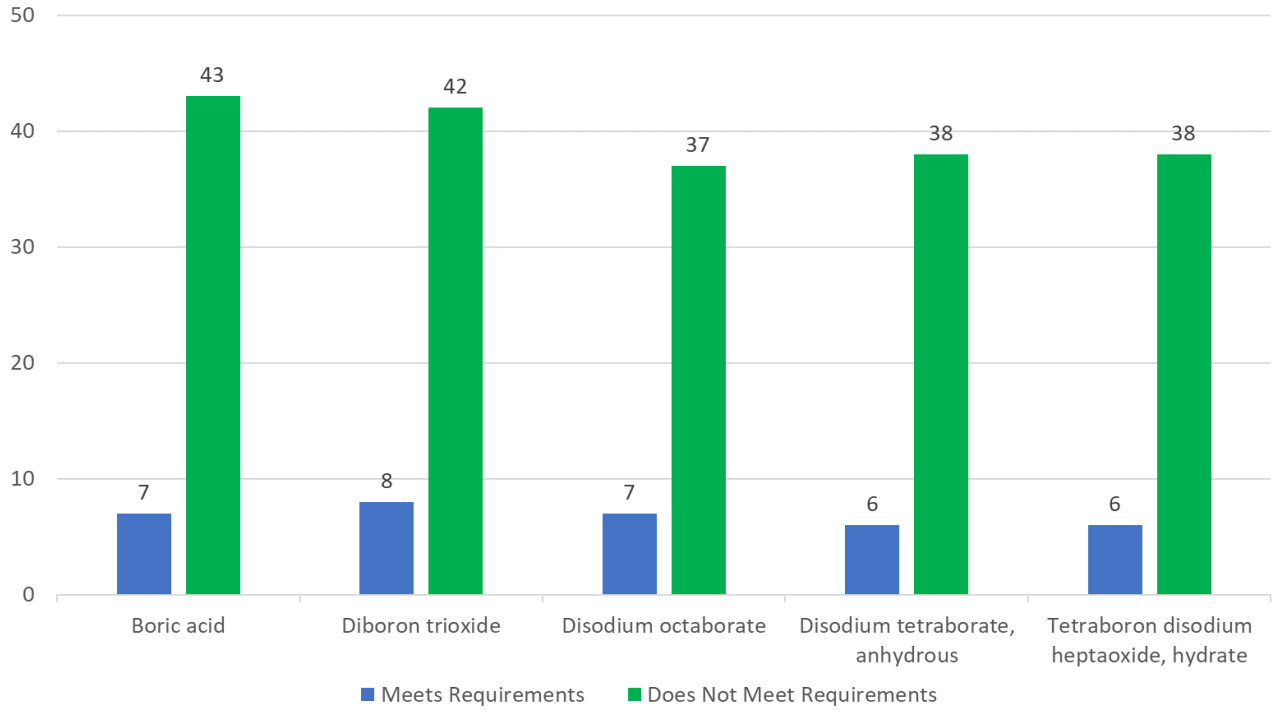

Figure 6 Number of Flame Retardants detections

Halogenated Solvents

In total, 1,136 analytes have been tested, among the 9 detections, 7 are above ZDHC limit (Figure 8). Tetrachloroethylene, Methylene chloride, 1,2-dichloroethane are the three halogenated solvents detected.

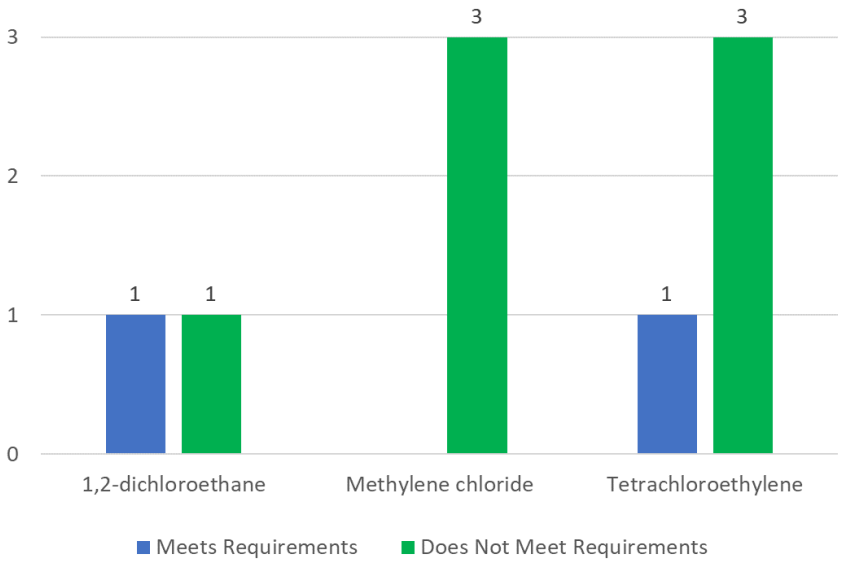

Figure 7 Number of Halogenated Solvents detections

Organotin Compounds

The results of 2,840 tests on Organotin Compounds show that there are 19 detections and are all above the ZDHC limits (Figure 9).

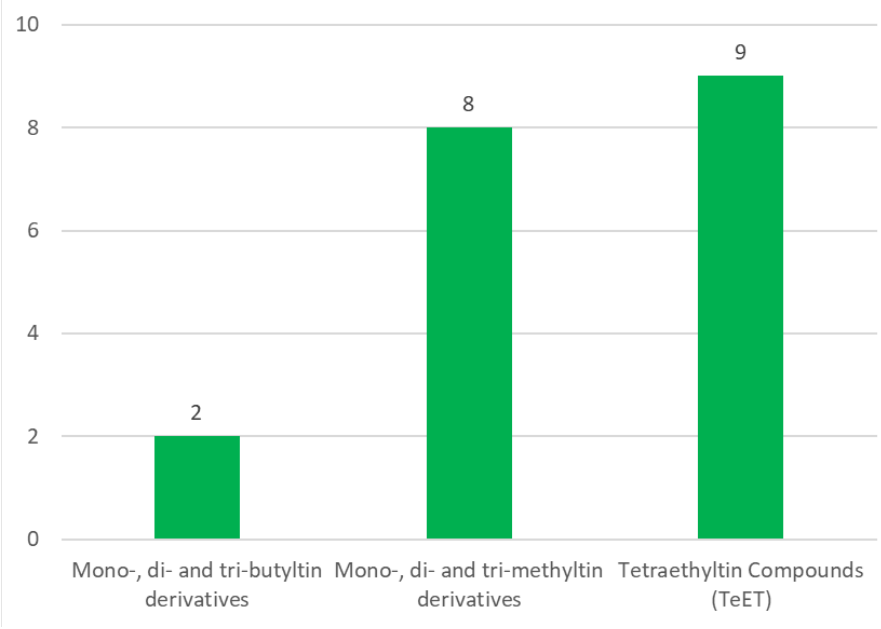

Figure 8 Number of Organotin Compounds' detections

Other/Miscellaneous Chemicals

Out of 154 facilities, a total of 1,420 tests were performed. From these tests, 35 detections were identified, but only 8 of these detections met the ZDHC Requirements (Figure 10).

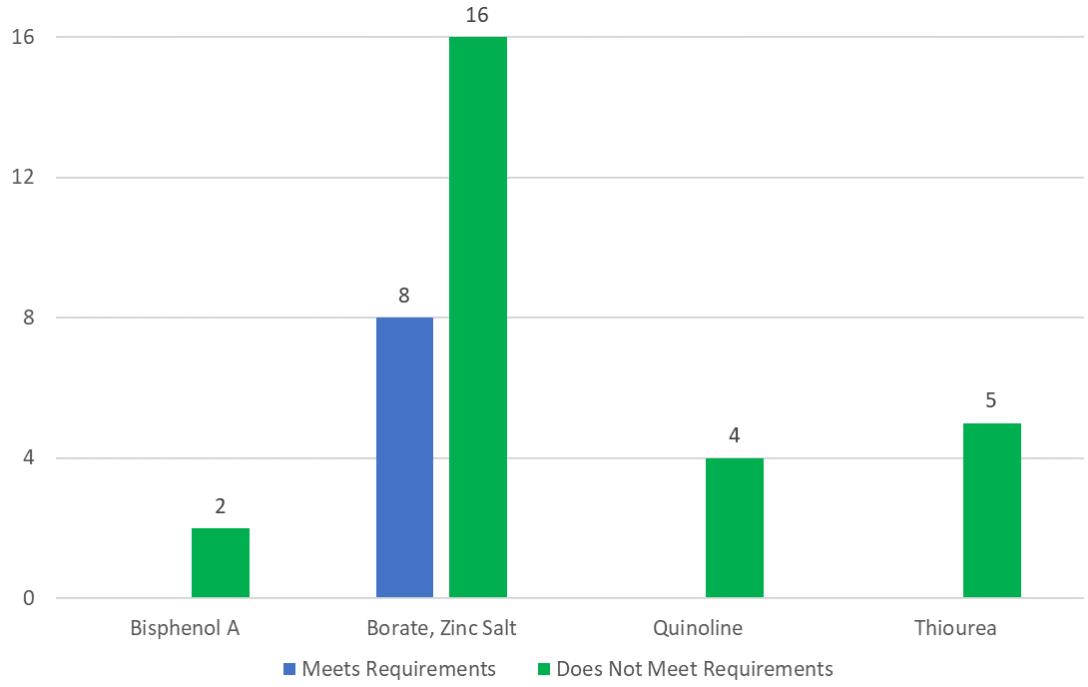

Figure 9 Number of Other/Miscellaneous Chemicals detections

Perfluorinated and Polyfluorinated Chemicals (PFCs)

PFCs is the group with the highest percentage (i.e., 3%) of detection. Among 568 PFCs compounds tested, 17 detections, 14 above the limit, have been found (Figure 11).

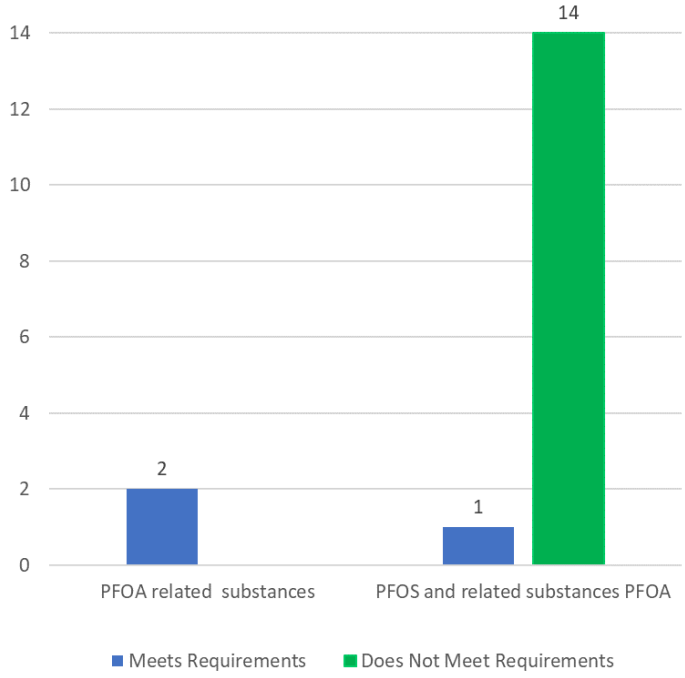

Figure 10 Number of PFCs' detections

Phthalates

The total number of tested analytes belonging to Phthalates is 5,112, 8 detected. The percentage of non-compliance is 0.16% in the Raw Wastewater (Figure 12).

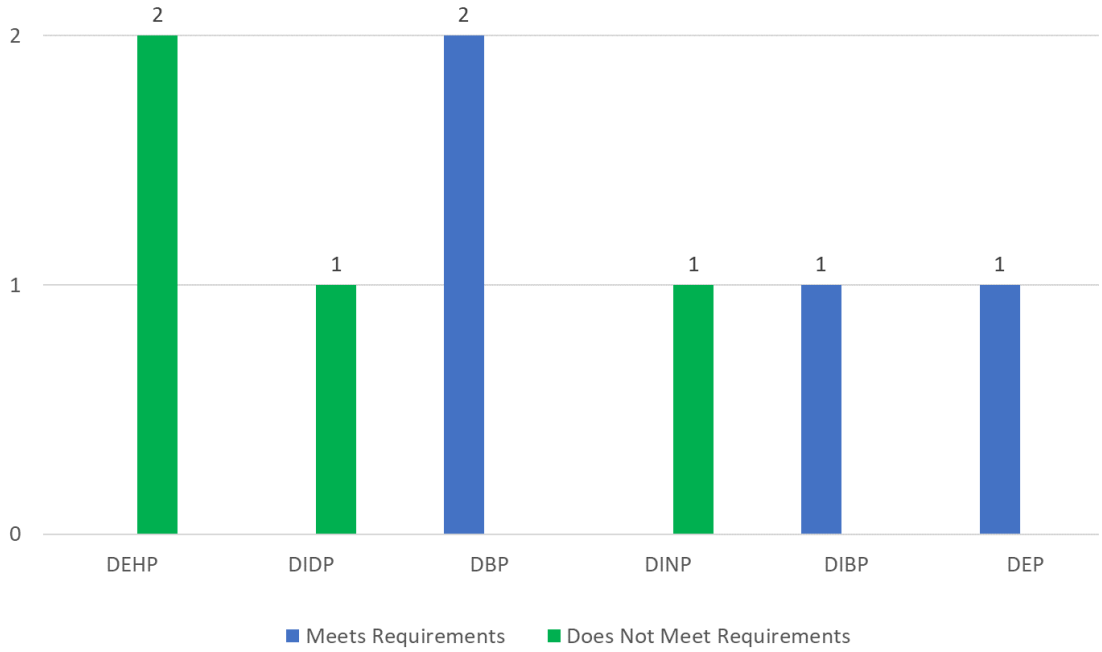

Figure 11 Number of Phthalates' detections.

Polycyclic Aromatic Hydrocarbons (PAHs)

The total number of tested Polycyclic Aromatic Hydrocarbons (PAHs) analytes is 5,112 with 5 detections all referred to one analyte, Naphtalene. Among these 5 detections, 2 do not meet the requirement for ZDHC (Figure 13).

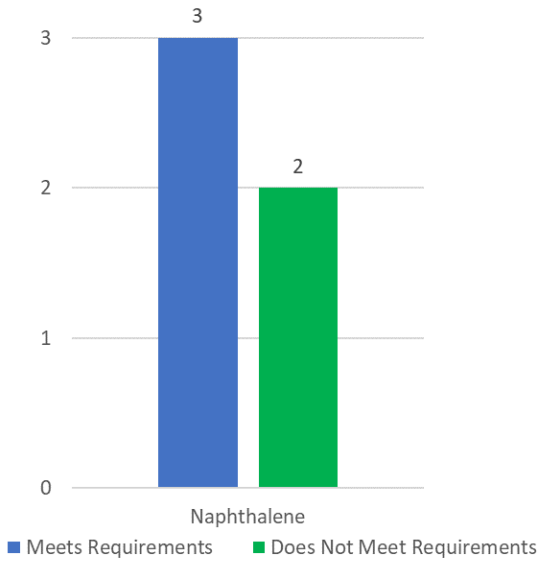

Figure 12 Number of PAHs detection

Volatile Organic Compounds (VOC)

The total number of tested analytes within the VOC's group is 1,704 with 33 detections in Raw Wastewater, 11 meet the ZDHC requirements (Figure 14).

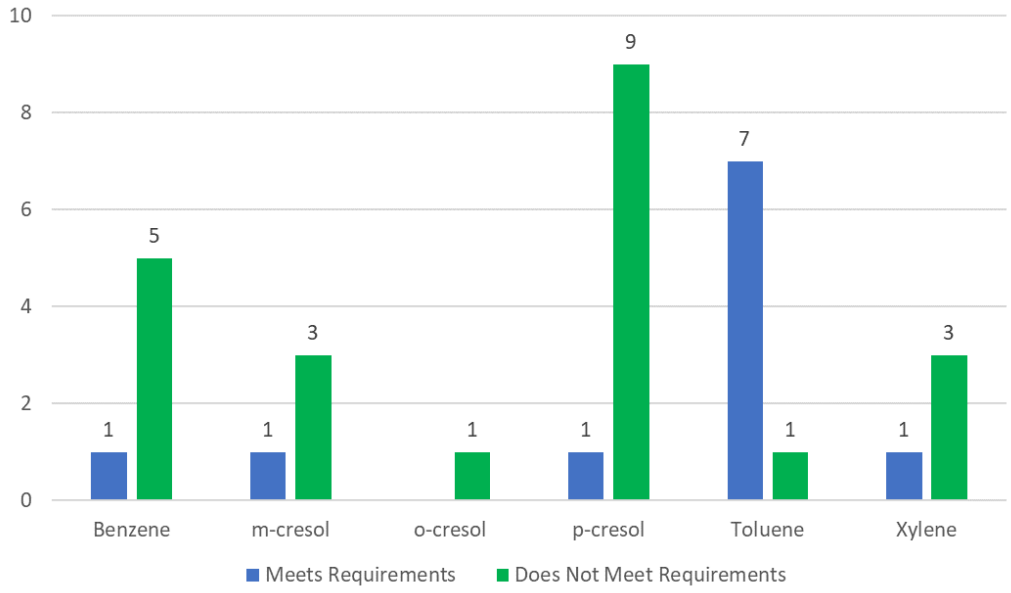

Figure 13 Number of VOC's detections

No detections were found for the following groups of substances: Anti-Microbials & Biocides, Chlorinated Parafins, Glycols / Glycols Ethers, Dimethylformamide and UV Absorbers.

2. HEAVY METALS

Heavy Metals group has been analyzed in Raw Wastewater with 2,595 tested analytes, 132 detected (Figure 15). Major detections have been found for Arsenic, Barium and Lead, followed by Chromium total and Antimony, then, Cupper, Mercury, Nickel and Zinc while there are close to null the remaining Cadmium, Cobalt, Chromium(VI), Selenium, Silver and Tin.

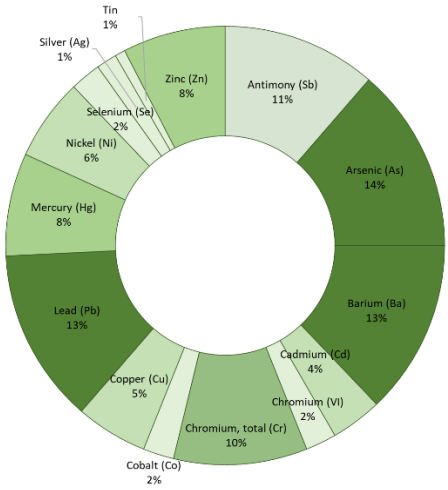

Figure 14 Number of Heavy Metals detections

Looking at the graph in the Figure 16, which shows the percentage of analytes that fall within the classification levels for ZDHC concentrations, it is noticeable that for the metals analyzed, almost the entire aspirational level has been reached. The only analyte that presents a test in which the concentration has not reached the foundational level is Anthimony defined as “Alert”.

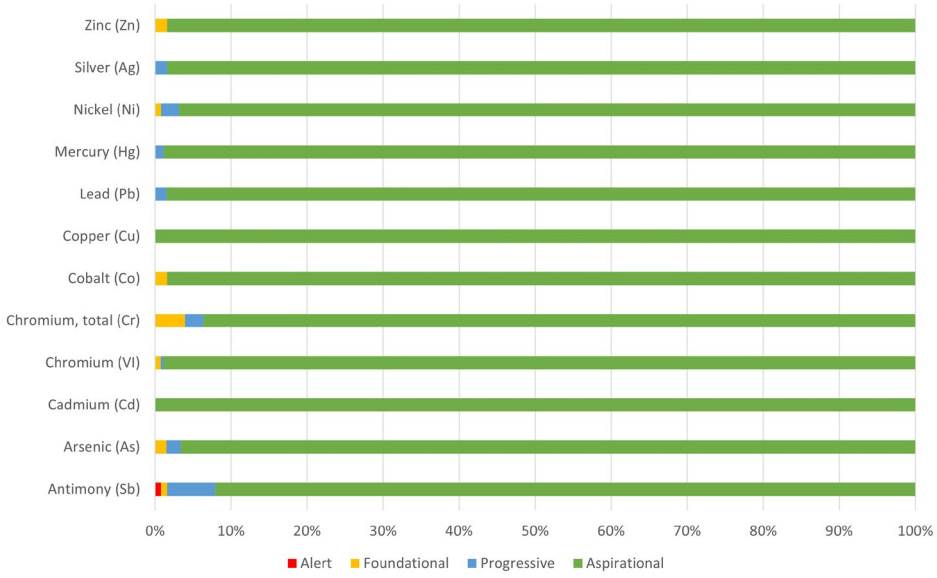

Figure 15 Percentage of Heavy Metals in ZDHC Limits

3. ANIONS

The group of Anions is constituted by Chloride, Cyanide, Sulfate, Sulfide and Sulfite and the total number of tests performed is 630 of which 349 have been detected (Figure 17).
Sulfate and Chloride are the most detected but as for the concentration ZDHC requires only the "sample and report", in terms of quantity it is found Sulfite and Sulfide and the least detected is Cyanide.

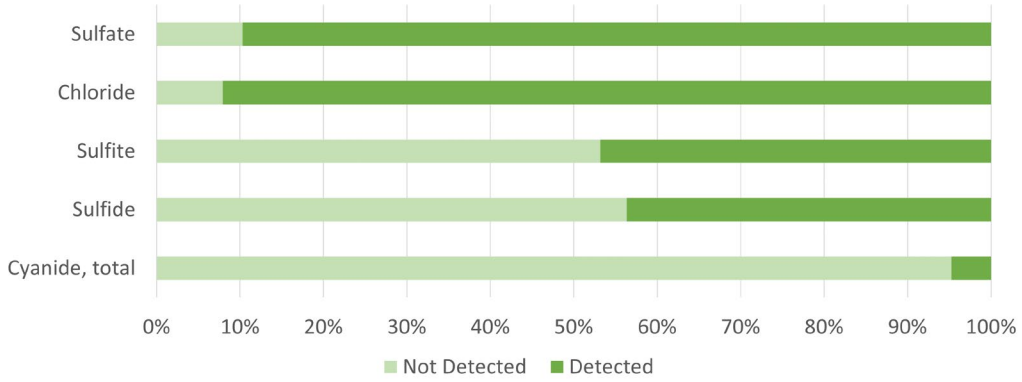

Figure 16 Percentage of Anions detected.

As mentioned above, concentration of Sulfate and Chloride are only sample and report, for Sulfite, Sulfide and Cyanide limits on concentration are classified in 3 levels as requested by ZDCH and in Figure 18 are reported schematically.

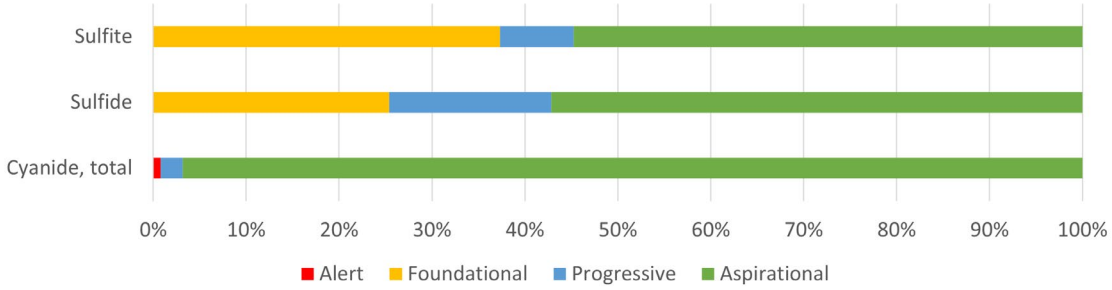

Figure 17 Percentage of Anions in ZDHC Limits

By looking at the presence of Anions in Raw Wastewater, it is clear that for the majority of tests reports concentrations are in the range of Aspirational.
The concentrations of Cyanide are represented mostly at Aspirational but also has concentrations higher than the foundational limit defined as "Alert".

4. CONVENTIONAL PARAMETERS

As already noted, in this work Conventional Parameters refer to the Sum Parameters defined in Appendix A of the ZDHC Wastewater Guideline v.2.1. In this section results of tests made in facilities having direct discharge (i.e. having an own ETP) are analyzed.
These parameters, in fact, mostly refer to the proper functioning of an ETP and they can be briefly summarized in temperature, pH, biological oxygen demand (BOD5) or chemical oxygen demand (COD), that's the reason why it has no sense to test them in wastewater before treatment, unless supplier uses a centralized effluent treatment plant (CETP). In this specific case, these parameters should be compliant with the legal discharge permit and/or receiving CETP limits that could be different from ZDHC requirements.
In 2023, facilities with direct discharge represent more or less 40% of the wet process suppliers working with Benetton and the total number of tests performed is 2016.

In Figure 19 are represented the percentage of parameters that have reached levels accordingly with the ZDHC guidelines.
Values of Dissolved Oxigen (DO), Total Chlorine, Total Dissolved Solids (TDS) and Wastewater Flowrate are not reported because it is required only to "Sample and Report".

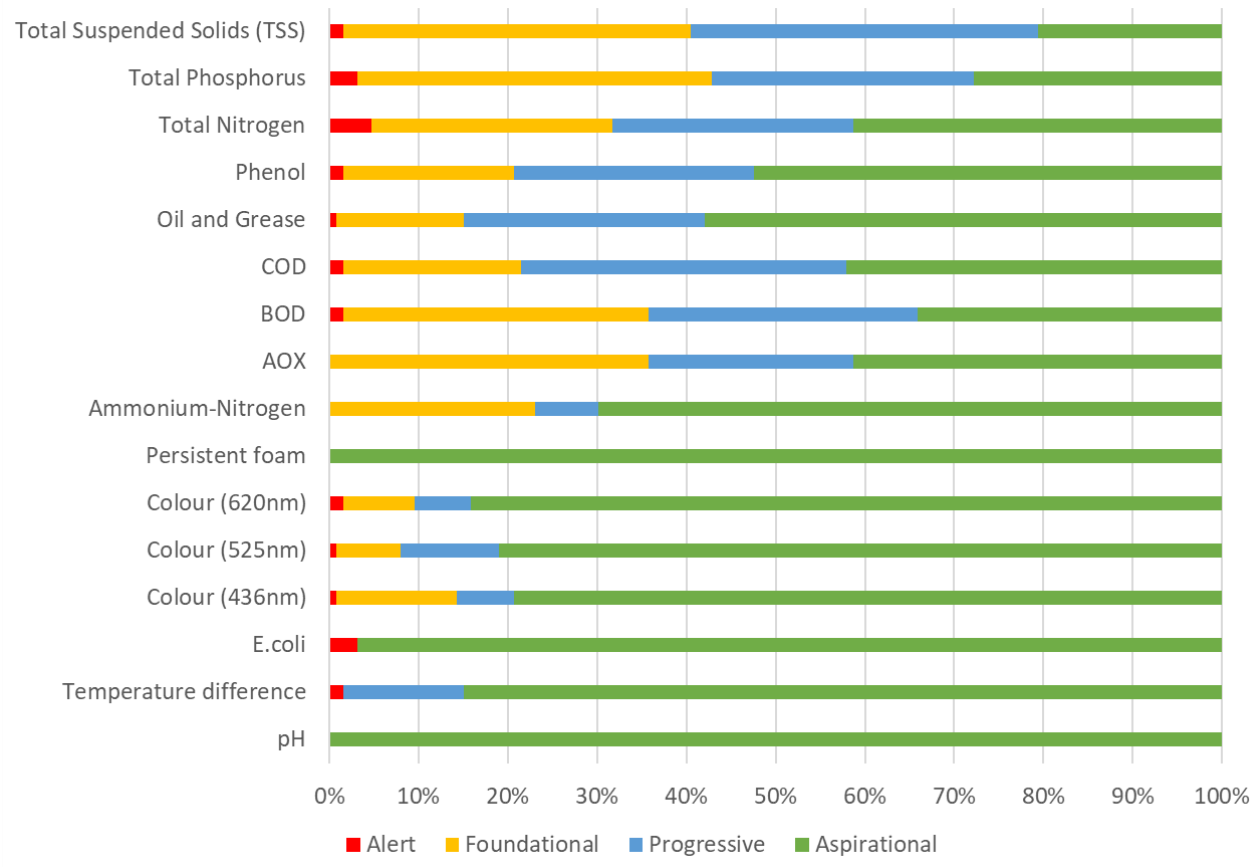

Figure 18 Percentage of Conventional Parameters in ZDHC Limits

For the majority of parameters analyzed more than the 50% of the concentration have reached the aspirational limit but, at the same time, the majority have at least one concentration that did not reach the foundational level and it is defined as "Alert".

Conclusion

Textiles industry is one of the major users of hazardous chemicals and industrial polluter of freshwater but since the beginning of the Greenpeace Detox campaign (in 2011), many progresses have been reached even if the goal of the total elimination of the hazardous chemicals has not been accomplished yet.

From our results, in fact, it emerges that some hazardous chemicals are still present in discharged water, and this could be associated either with the already presence in the incoming water or with the use of those substances in the process, meaning that the Chemical Inventories of the suppliers are not fully aligned with the ZDHC parameters yet. It has to be noted that, to be truthful, the presence of some substances very low detected could probably derive from impurities in chemicals or commodities.

Independently from the obtained results in 2023, Benetton will continue encouraging its suppliers to achieve a cleaner production and it will enforce the control on the suppliers input chemicals management. Moreover, together with other brands, Benetton will continue enhancing the visibility of ZDHC and Cascale tools to improve the supply-chain performance and to analyze the results as a “global” industry.