UNITED COLORS OF BENETTON.

# Benetton Group srl

# 2024 Wastewater Analysis

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## 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 four 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 2024 year.
All the tests have been performed according to ZDHC Wastewater Guideline V 2.1 and Wastewater Guideline V 2.2 (update made by ZDHC in September 2024). It should be noted that in the processing of data and results reported in this document, both versions have been taken into account.

[1] Benetton's Detox Commitment available at: https://www.benettongroup.com/en/sustainability/nature/water/detox/
[2] http://www.roadmaptozero.com/
[3] https://cascale.org/

## 2024 Wastewater Analysis

According to the data collected from the test reports published in the ZDHC Gateway – Wastewater Module during 2024, it emerges that 168 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 64% of these plants are in Asia (mainly in Bangladesh, China and India) and 36% in the Mediterranean Area (mainly in Italy, Egypt and Turkey).

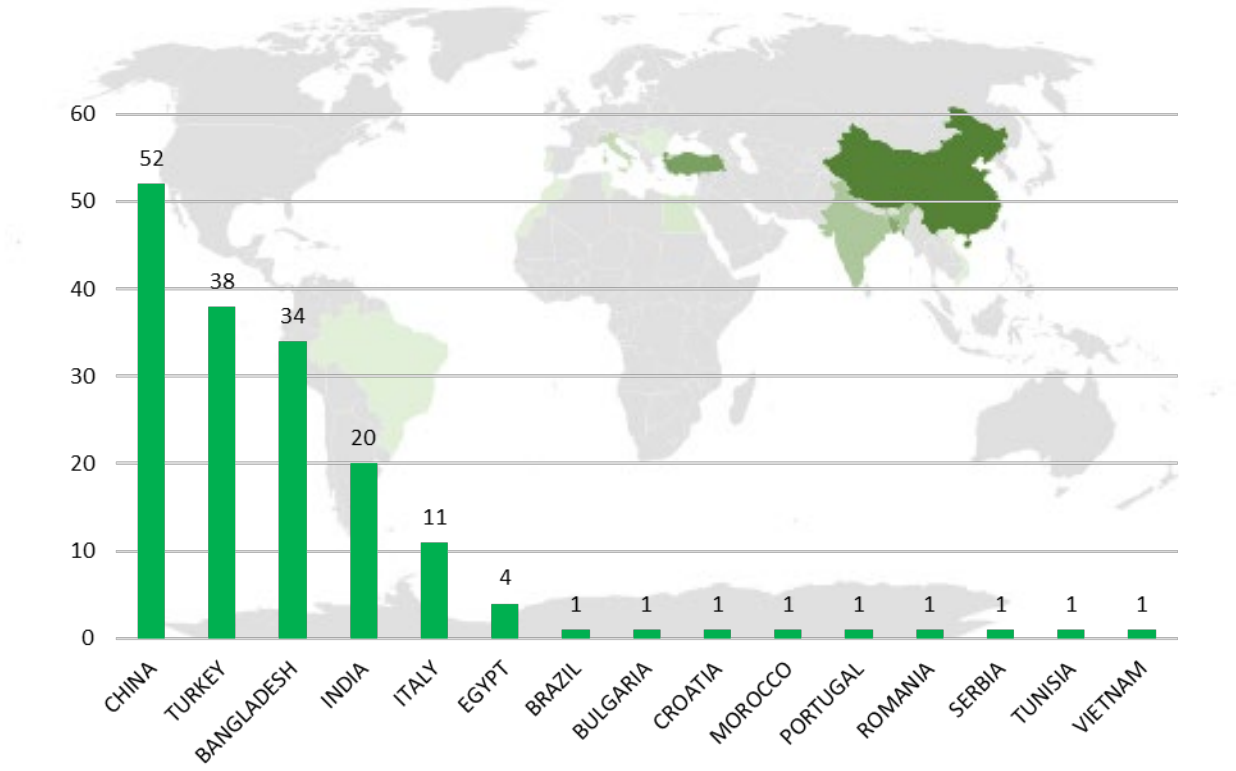


Figure 1 Country Distributions

The collected data refer to facilities having different types of Effluent Treatment Plant (ETP) such as direct discharge (i.e., 66 facilities), indirect discharge (i.e., 95 facilities) and zero liquid discharge (i.e., 9 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[4]: MRSL Parameters, Heavy Metals, Anions and Conventional Parameters.

[4] ZDHC Wastewater Guideline are available at: https://www.roadmaptozero.com/output

## 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 – 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), Restricted Aromatic Amines (Cleavable from Azo-colourants), UV Absorbers, Volatile Organic Compounds (VOC). All these groups have been tested in the Untreated Wastewater according to the methods described in the ZDHC WW Guideline.
In total, concerning MRSL parameters, 62,671 analytes have been tested and results show that only 527 (less than 0.9%) have been detected (both below and above ZDHC Limits).
For those exceeding the ZDHC limits, compliance is shown graphically in Figure 2. Therefore, we can conclude that, in general, facilities are very close to the total compliance of MRSL Parameters.

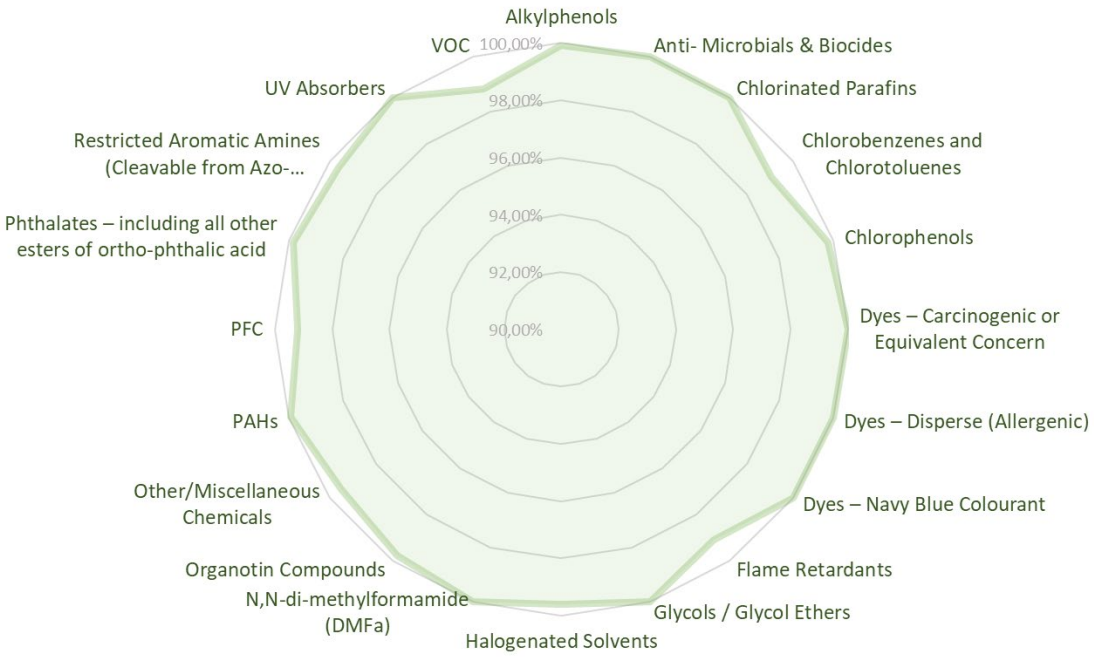


Figure 2 Compliance of ZDHC MRSL Parameters

## Alkylphenols and Alkylphenols Ethoxylates (AP/APEO)

Among the 1,260 Alkylphenols and Alkylphenols Ethoxylates (AP/APEO) tested, only in one sample *Nonylphenol ethoxylates* (NPEO) was detected and exceed the ZDHC Limits.

## Chlorobenzenes and Chlorotoluenes

Chlorobenzenes and Chlorotoluenes have been detected in the Untreated Wastewater of 6 different facilities, 3 detection of *1,2-dichlorobenzene* and 3 detections of *Other isomers of chlorotoluene*. In total, 630 analytes have been tested with a percentage of detection of 0.95% (Figure 3 ).

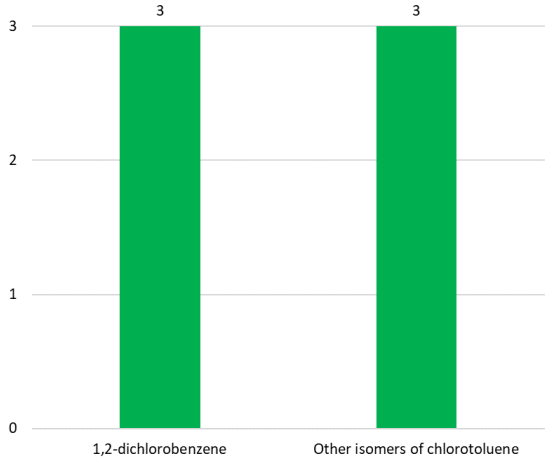


Figure 3 Number of Chlorobenzenes and Chlorotoluenes detections

## Chlorophenols

The total number of tested Chlorophenols is 5,985 with 13 non-conformities, all above ZDHC limit except one (Figure 4).

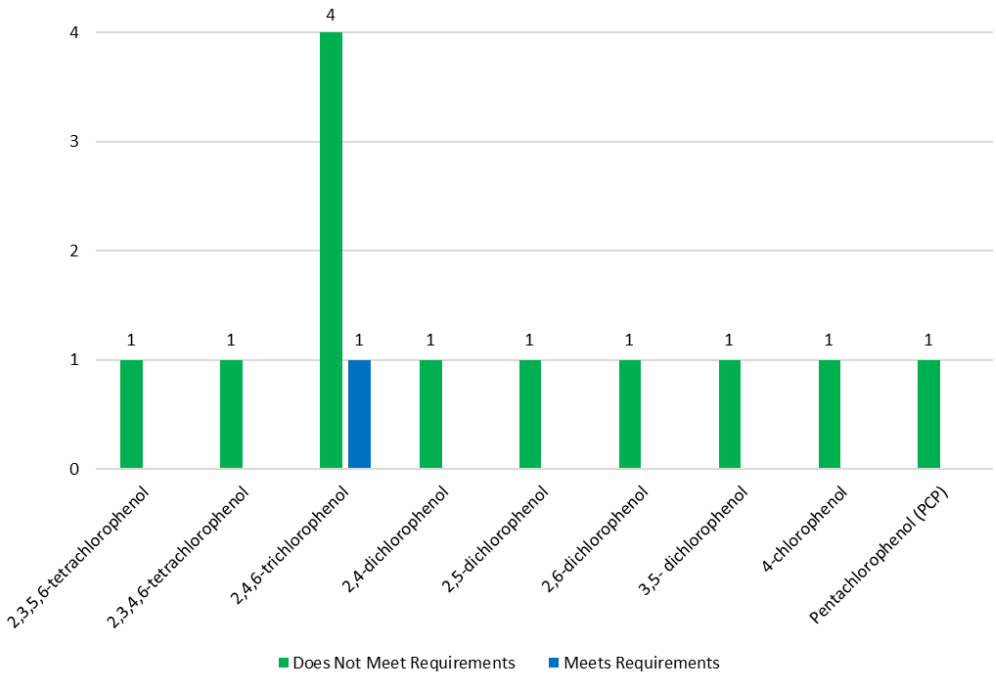


Figure 4 Number of Chlorophenols' detections

## Dyes

Among 11,011 tests performed on Dyes the compliance is 100%. From results, in fact, there is not any detection of Dyes – Carcinogenic (4,725 tested analytes), Dyes – Disperse (5,670 tested analytes) and Dyes - Navy Blue Colourant (616 tested analytes).

## Flame Retardants

The total number of analytes tested is 9,450 with 282 detections. On average about 40 analytes were found for each of the 5 parameters detected out of a total of 30 Parameter tested for Flame Retardants (Figure 5). 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.
For this reason, in order to be in line with the same requirements for all facilities we re-evaluated as "Meets Requirements" all the detection lower than the new limit of the ZDHC Wastewater Guidelines V 2.2 published by ZDHC in September 2024.

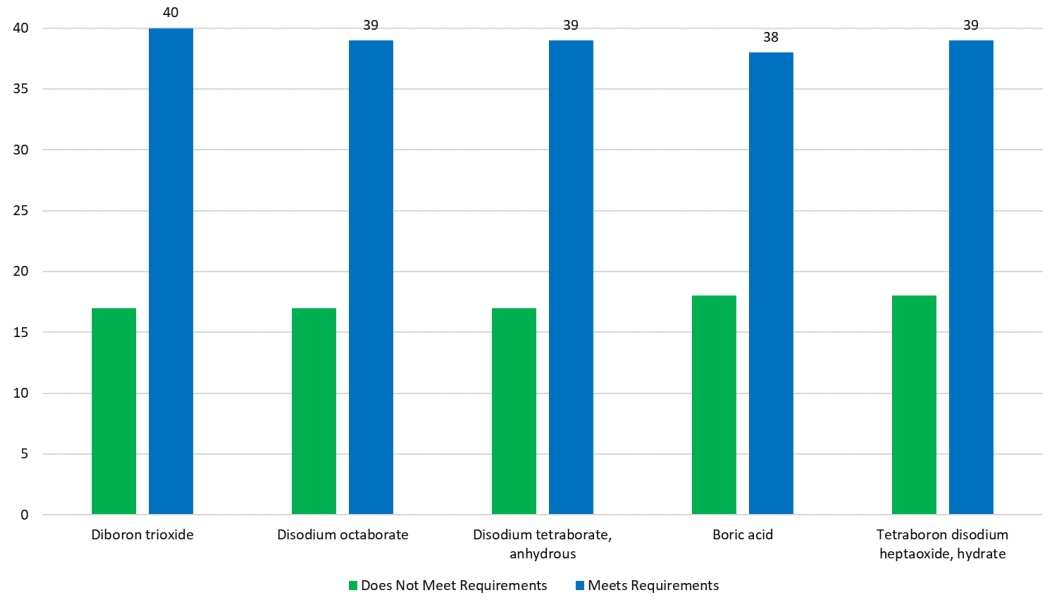


Figure 5 Number of Flame Retardants detections

## Halogenated Solvents

In total, 1,260 analytes have been tested, among the 6 detections, 5 are above ZDHC limit (Figure 6). Methylene chloride, Tetrachloroethylene and Trichloroethylene are the three halogenated solvents detected.

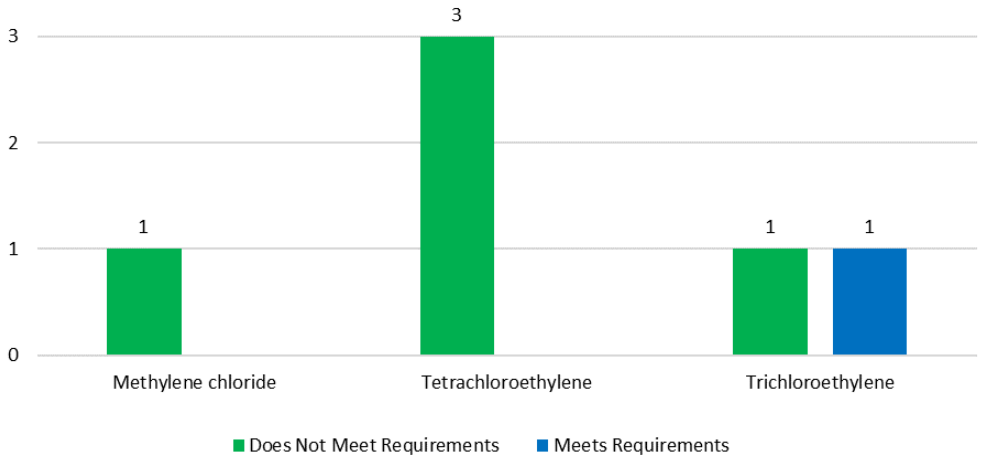


Figure 6 Number of Halogenated Solvents detections

## Organotin Compounds

The results of 3,150 tests on Organotin Compounds show that there are 8 detections and are all above the ZDHC limits (Figure 7).

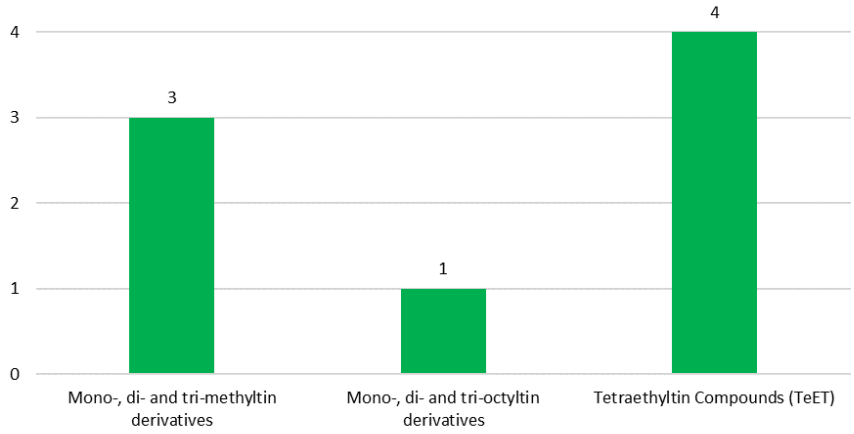


Figure 7 Number of Organotin Compounds' detections

## Other/Miscellaneous Chemicals

Out of 168 facilities, a total of 1,575 tests were performed. From these tests, 99 detections were identified, but only 13 of these detections are reported graphically in Figure 8, 5 met the ZDHC Requirements.

For the reason explained in paragraph Flame Retardants this year the Wastewater guidelines encountered some changes and for the parameter *Borate, Zinc Salt* there were some difficulties elaborated the data, for these reasons this year was not taken into account and not reported in the graphs.

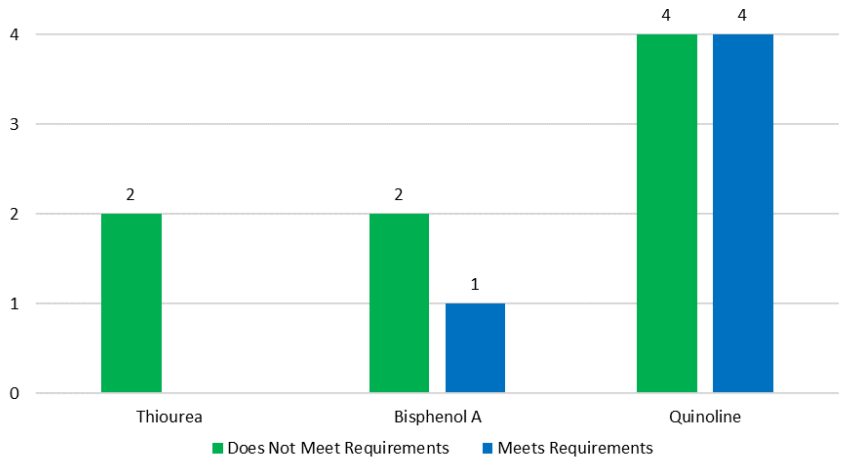


Figure 3 Number of Other/Miscellaneous Chemicals detections

## Perfluorinated and Polyfluorinated Chemicals (PFCs)

Among 630 PFCs tested compounds, 9 detections, 5 above the limit, have been found (Figure 9).

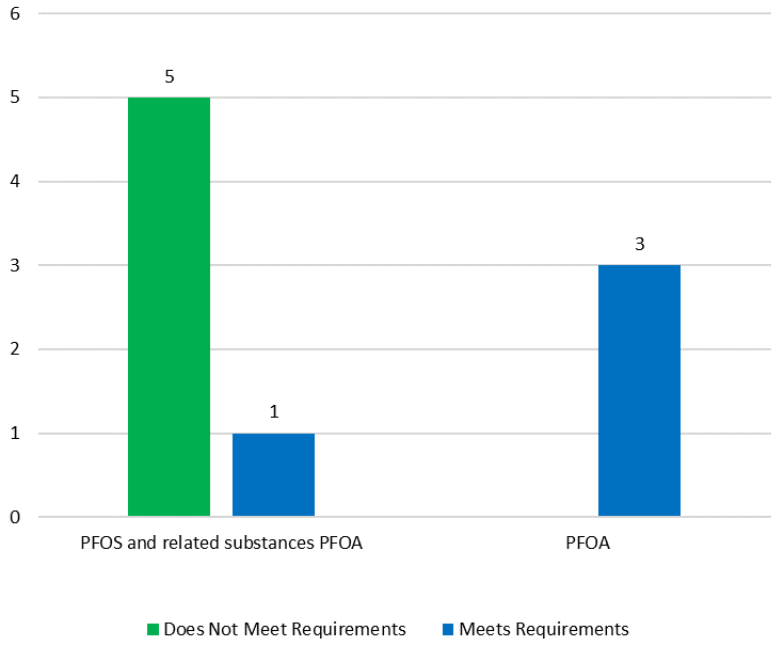


Figure 9 Number of PFCs' detections

## Phthalates

The total number of tested analytes belonging to Phthalates is 5670, 18 detected. The percentage of non-compliance is 0.32% in the Untreated Wastewater (Figure 10).

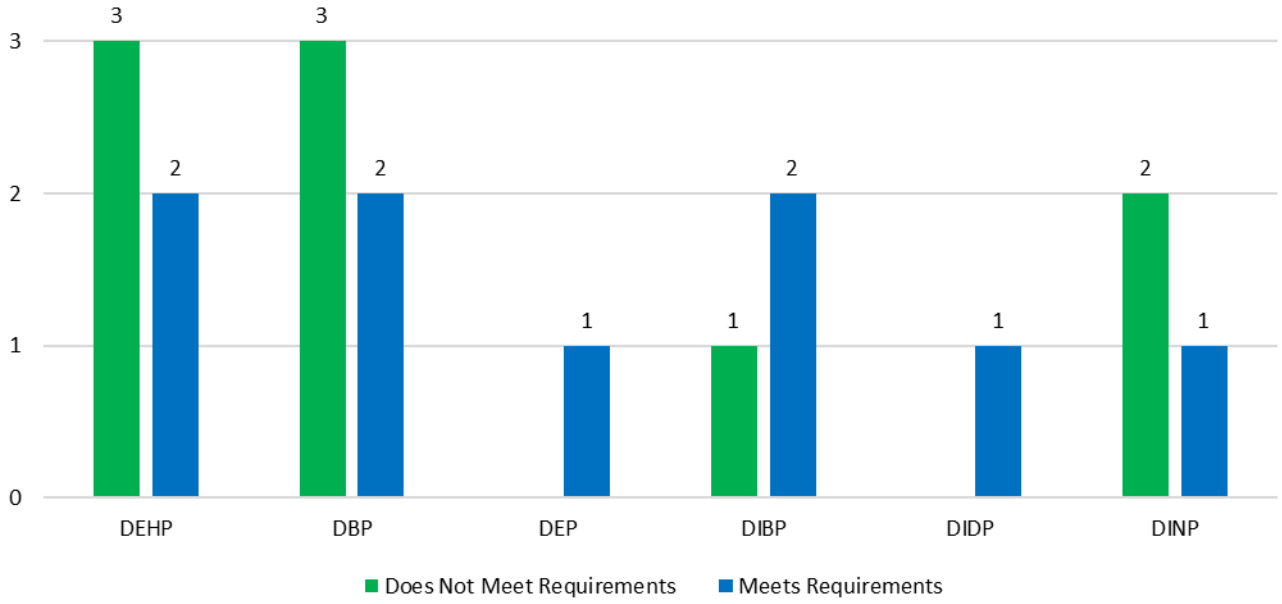


Figure 10 Number of Phthalates' detections.

## Polycyclic Aromatic Hydrocarbons (PAHs)

The total number of tested Polycyclic Aromatic Hydrocarbons (PAHs) analytes is 5,670 with 14 detections. Among these 14 detections, 4 do not meet the requirement for ZDHC (Figure 11).

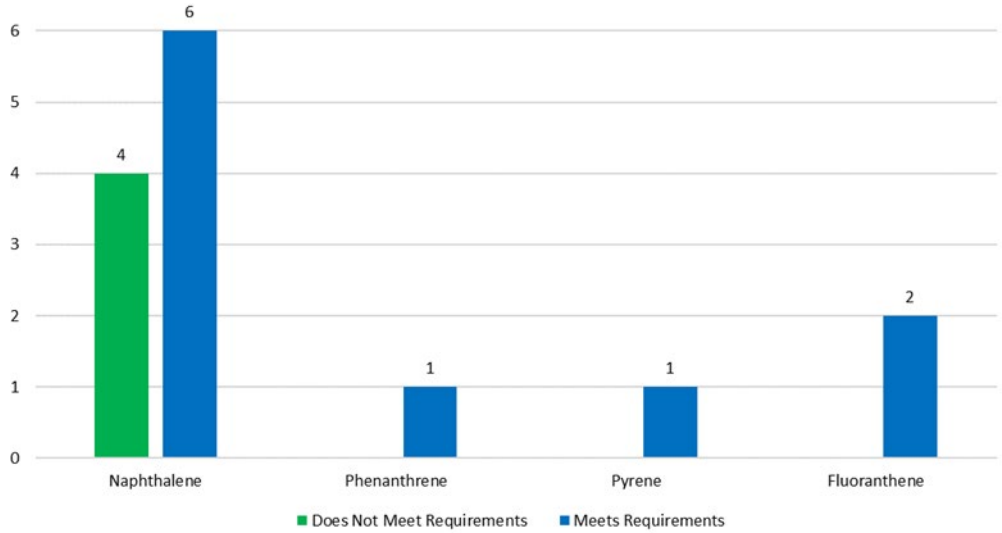


Figure 11 Number of PAHs detections

## Restricted Aromatic Amines (Cleavable from Azo-colourants)

Non conformities of Restricted Aromatic Amines represent 0.4% on the total tested. Figure 12 shows detection among all 4-chloroaniline is the substance with the highest number of detections (22).

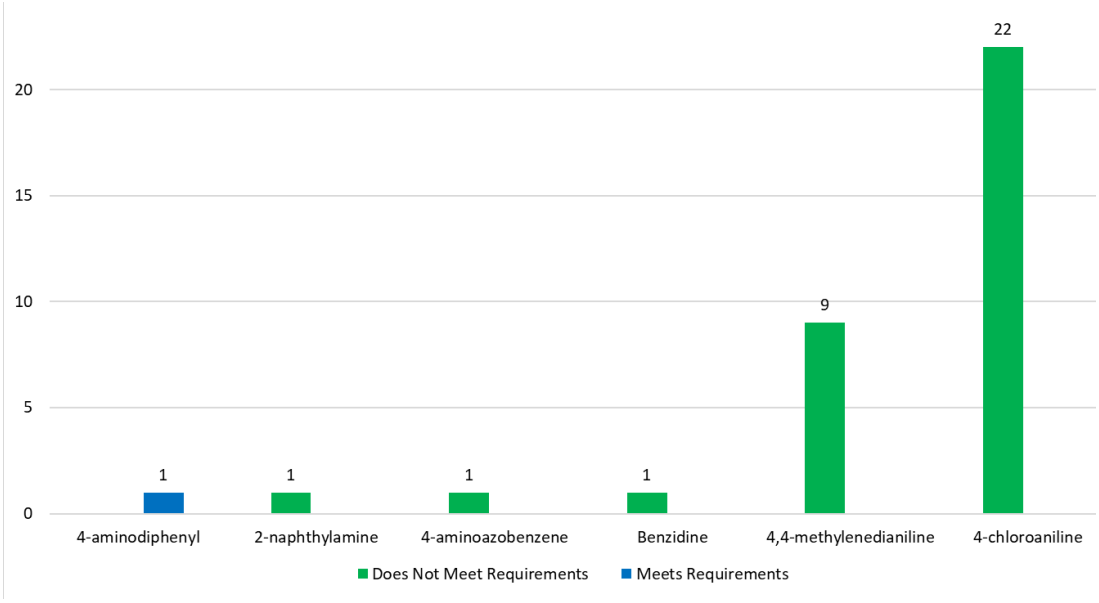


Figure 12 Number of Restricted Aromatic Amines

## Volatile Organic Compounds (VOC)

The total number of tested analytes within the VOC's group is 1,890 with 28 detections in Untreated Wastewater, 6 meet the ZDHC requirements (Figure 13).

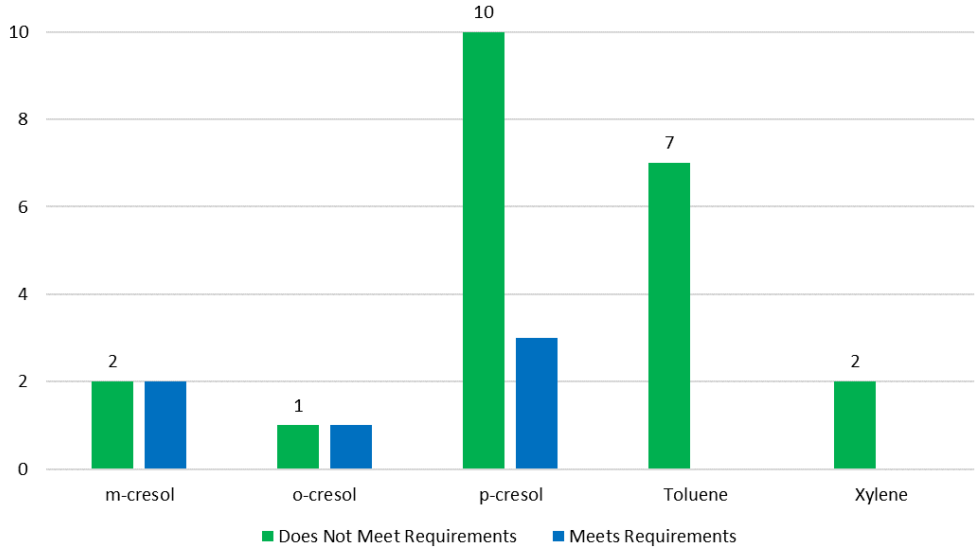


Figure 13 Number of VOC's detections

No detections were found for the following groups of substances: Chlorinated Parafins, Dyes – Carcinogenic or Equivalent Concern, Dyes – Disperse (Allergenic), Dyes – Navy Blue Colourant, Glycols / Glycol Ethers and UV Absorbers.

## 2. HEAVY METALS

Heavy Metals group has been analyzed in Raw Wastewater with 2,825 tested analytes, 149 detected (Figure 14). Major detections have been found for Barium, Arsenic, Zinc and Antimony, followed by Lead and Chromium total and Copper, then, Nickel, Mercury, Cobalt and Chromium(VI), while there are close to null the remaining Cadmium, Selenium, Silver and Tin.

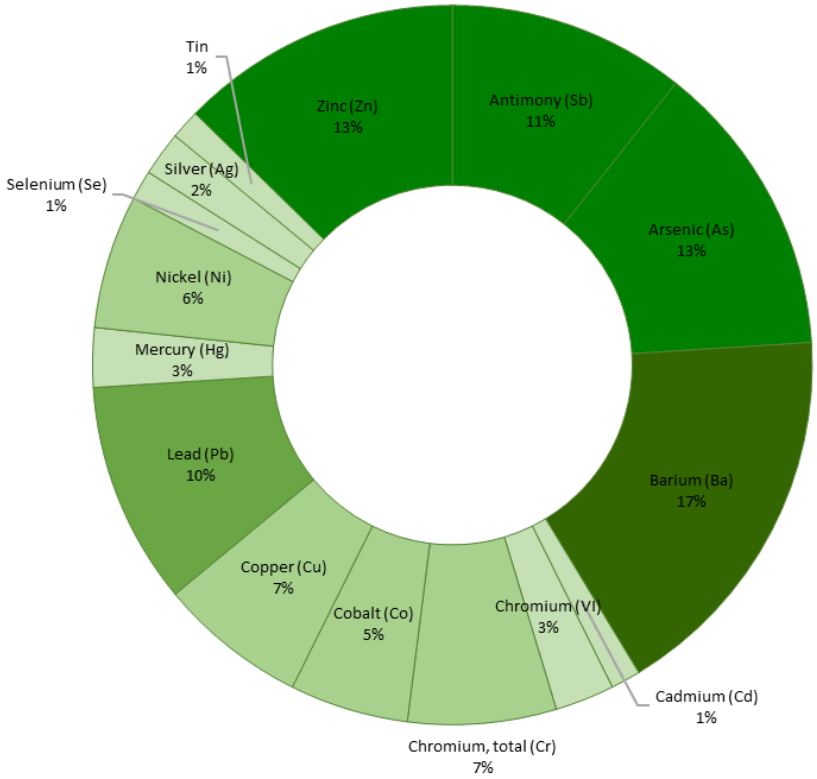


Figure 14 Number of Heavy Metals detections

Looking at the graph in the Figure 15, 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.

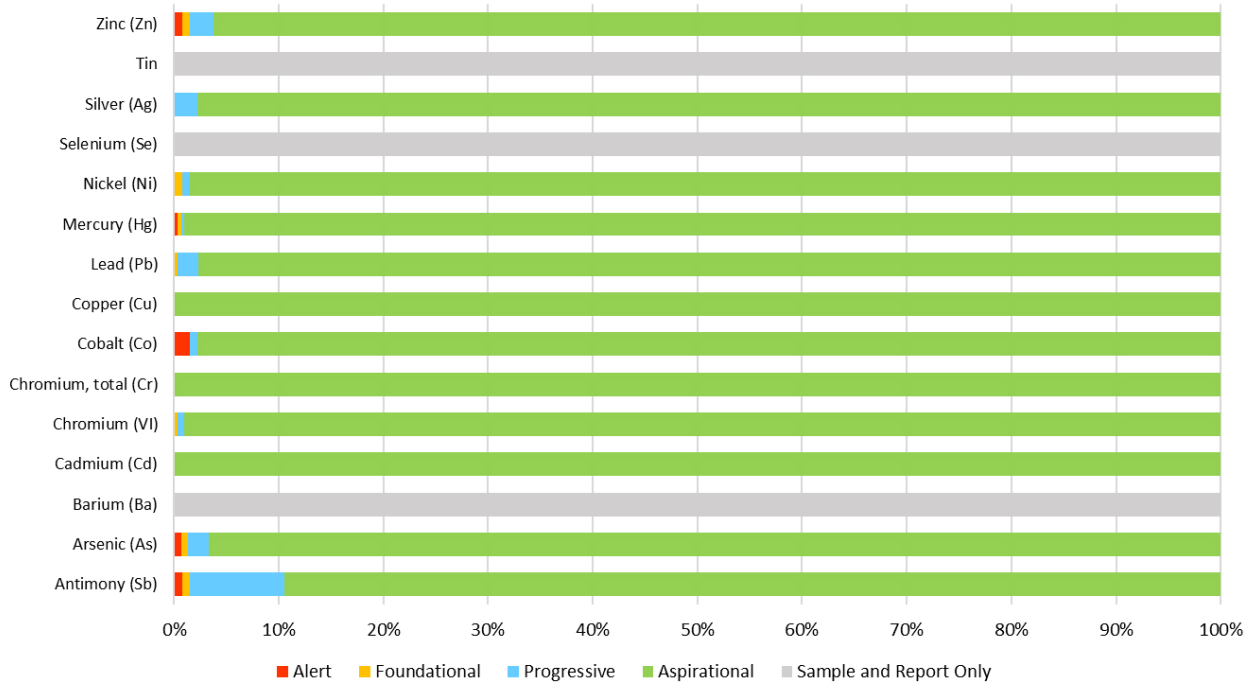


Figure 15 Percentage of Heavy Metals in ZDHC Limits

## 3. ANIONS

The group of Anions is constituted by Chloride, Cyanide, Sulfate, Sulfide and Sulfite and the total number of tests performed is 665 of which 331 have been detected (Figure 16).
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.

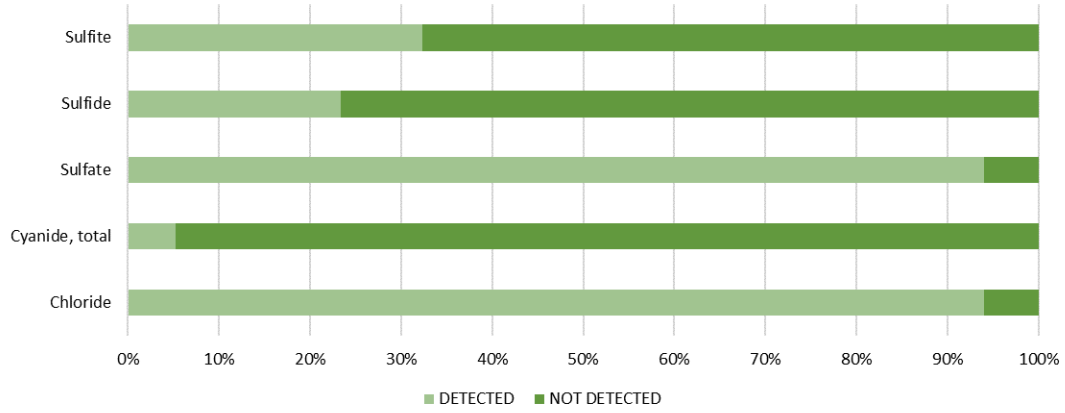


Figure 16 Percentage of Anions detected.

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 17 are reported schematically.

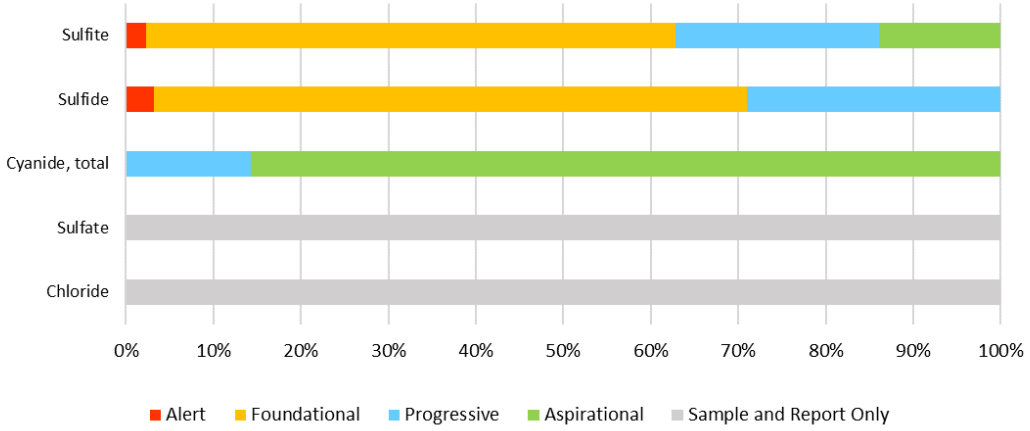


Figure 17 Percentage of Anions in ZDHC Limits

## 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 2024, 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 2,660.

In Figure 18 are represented the percentage of parameters that have reached levels accordingly with the ZDHC guidelines.

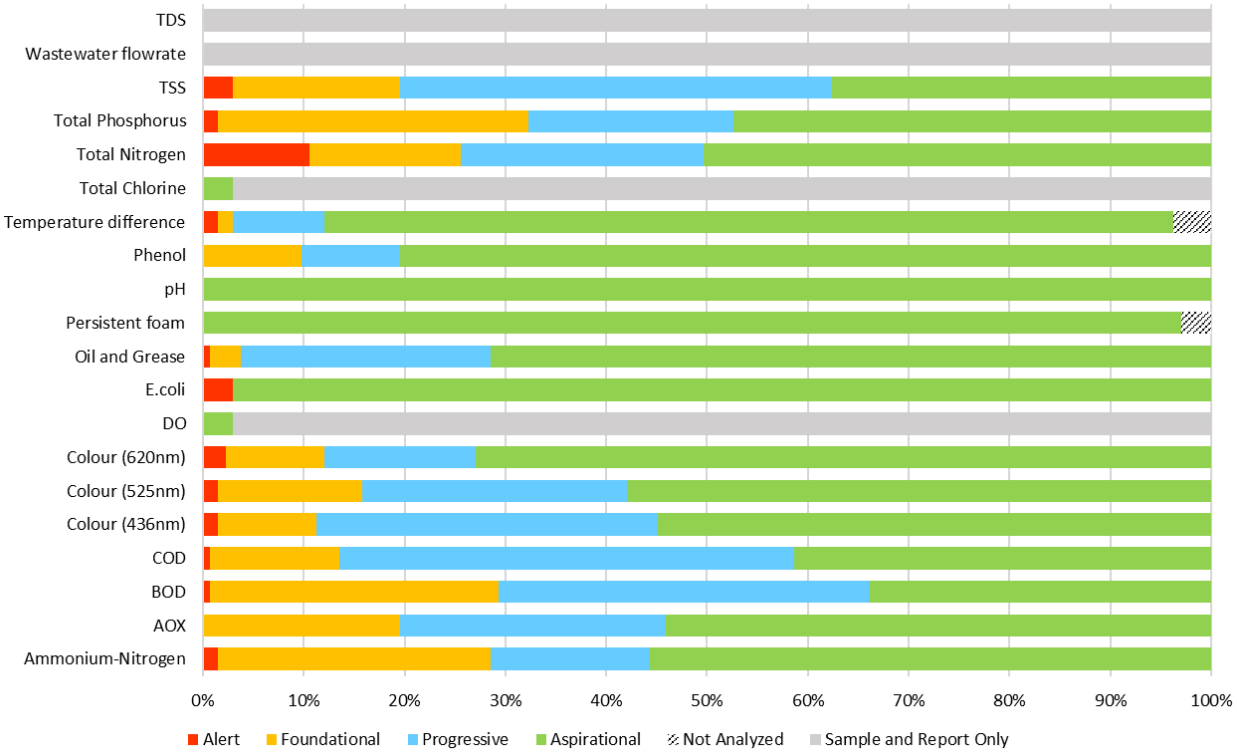


Figure 18 Percentage of Conventional Parameters in ZDHC Limits

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”.

## 5. SLUDGE

As required by the ZDHC Wastewater Guidelines, suppliers must also test the sludge generated as a by-product of wastewater treatment processes. Wastewater treatment sludge is a necessary and unavoidable by-product of proper wastewater treatment. Inadequate sludge management can have a negative impact on human health and the environment.

Of all the parameters tested, not all were classified as “Meets Requirements” or “Does Not Meet Requirements” because the requirements change depending on the type of discharge from the supplier's plant and the different sludge disposal routes that the supplier chooses and declares to use, as indicated in the ZDHC Wastewater Guidelines.

A total of 9,754 parameters were tested for our value chain in 2024: 5,401 MRSL parameters, 918 Conventional parameters, 229 Anions and 3,206 Metals.

Among these tests, not all were subject to evaluation; in fact, for 80% of the tests, only "Sample and Report" was required. For all the others, compliance was nearly 100%, as there were only two detections that didn't meet ZDHC requirements for Heavy Metals (Figure 19).

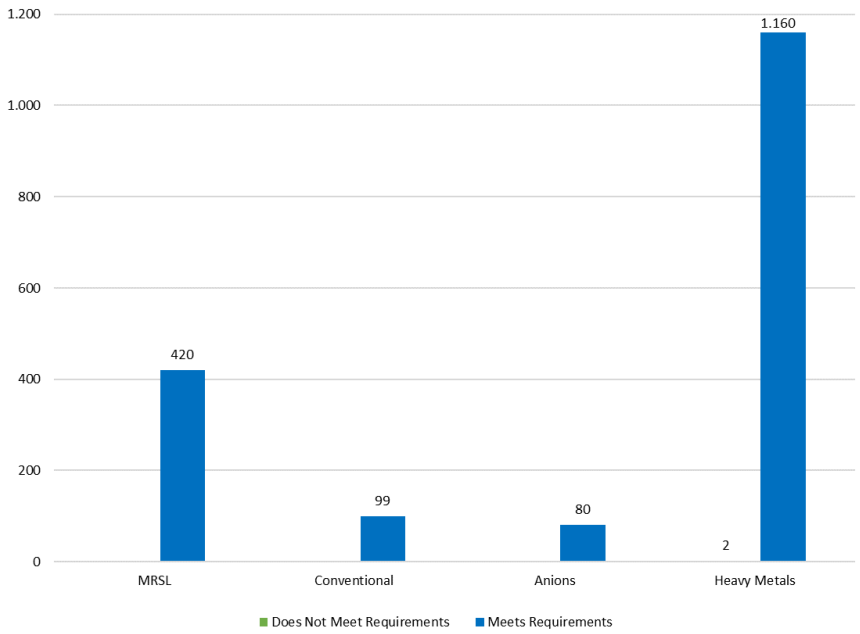


Figure 19 Number of Detection in Sludges

## 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 2024, 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.