

APEOs investigation report

as of July 2013

BENETTON GROUP COMMITMENT

Within its commitment to zero discharges, Benetton Group is engaged to completely eliminate Alkylphenol ethoxylates (APEOs) from all its products and processes.

WHAT ARE APEOS?

APEOs are a wide class of non ionic surfactants, including Nonylphenol ethoxylates (NPEs) and Octylphenol ethoxylates (OPEs), that can be used in chemical formulations such as (but not limited to) detergents, cleaning agents, spinning oils, printing pastes, wetting agents, dyeing agents, adhesives and scouring agents. Nonylphenol ethoxylates can break down to form the toxic, persistent and bioaccumulative Nonylphenol (NP) that, together with Octylphenol (OP), belongs to the Alkylphenols (APs) class of substances.

WHAT IS BENETTON GROUP DOING?

Benetton Group has been monitoring and limiting these substances in the supply chain and in its products, aiming at achieving zero discharges of hazardous chemicals.

Benetton Group has carried out an **intensive testing program** to screen the supply chain and to identify materials, products categories, suppliers, processes and geographical areas of higher concern. Moreover, **chemical intensive manufacturing units/suppliers are audited by independent external experts**, aiming at highlighting and handling existing or potential risks of APEOs contamination.

This report focuses on the key findings of a three-month benchmark on materials, treatments and prints.

WHAT, HOW AND WHERE BENETTON GROUP TESTED?

At the beginning of 2013 a wide number of APs and APEOs tests were performed and an in-depth analysis was carried out.

SAMPLING PERIOD

March 2013 - May 2013.

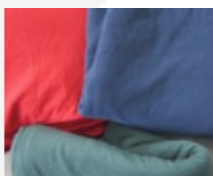
SAMPLES



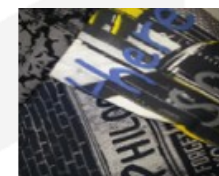
Yarns



Treatments



Fabrics



Prints

INVOLVED SOURCING AREAS

Global South

China, South East Asia (Cambodia, Laos, Vietnam, Thailand), India, Turkey, North Africa (Tunisia).

Global North

Central Europe, Eastern Europe.

LABORATORIES

To get **reliable and comparable results, all samples were tested in globally recognised ISO 17025 testing laboratories**, such as: Bureau Veritas Germany, Bureau Veritas HK, Bureau Veritas India, Bureau Veritas Shanghai, Bureau Veritas Singapore, SGS HK, Intertek Turkey, Intertek Italy, UL-ICQ HK, UL-ICQ Italy and Centro Tessile Cotoniero.

METHOD

Ultrasonic solvent extraction followed by Gas Chromatography Mass Spectrometry or Liquid Chromatography Mass Spectrometry, all these methods granting at least a 3 ppm detection limit for each analyte (see Table 1).

DETECTION LIMIT

3 ppm (best reproducible detection limit currently achievable by all testing laboratories).

Name	CAS n°
<i>Nonylphenol ethoxylates (NPEs_[1-20])</i>	Various
<i>Octylphenol ethoxylates (OPEs)</i>	Various
<i>Nonylphenol (NP)</i>	25154-52-3
<i>Octylphenol (OP)</i>	27193-28-8

Table 1: Analytes (APs-APEOs)*

*Branched and linear alkyl chains

WHAT RESULTS?

In order to provide statistically valuable information, this study involved more than **1100 samples**, **33.4%** of which were found to be **“positive” to APs-APEOs**.

Analyte	%
<i>NPEs</i>	32.0
<i>OPEs</i>	2.8
<i>NP</i>	1.5
<i>OP</i>	0.0

Table 2: Positive percentage per each analyte

Concentration range (ppm)	APs-APEOs (%)	NPEs (%)	OPEs (%)	NP (%)	OP (%)
> 1000	0.4	0.4	0	0	0
100 - 1000	5.0	5.0	0	0	0
3 - 100	28.0	26.7	2.8	1.5	0
<i>n.d.</i>	66.6	67.9	97.2	98.5	0

Table 3: APs-APEOs-positive percentages per concentration range

Looking at the different analytes (see Table 2), **32.0%** of the samples resulted **positive to NPEs**. Few NP and OPEs positives were found and these were usually found together with NPEs. No OP positive samples were highlighted.

Looking at the concentration ranges of found analytes (see Table 3), it is clear that the higher APs-APEOs percentage is concentrated in the 3-100 ppm range, with a prevalence of NPEs. NP values were always found to be below 10 ppm.



Figure 1: APs-APEOs-positive percentage for each category of samples

On a global scale, yarns and fabrics categories of samples showed a higher APs-APEOs-positive percentage.

APs-APEOs findings and higher risk samples for each sourcing area are represented on a world map for a better understanding (see Figure 2).

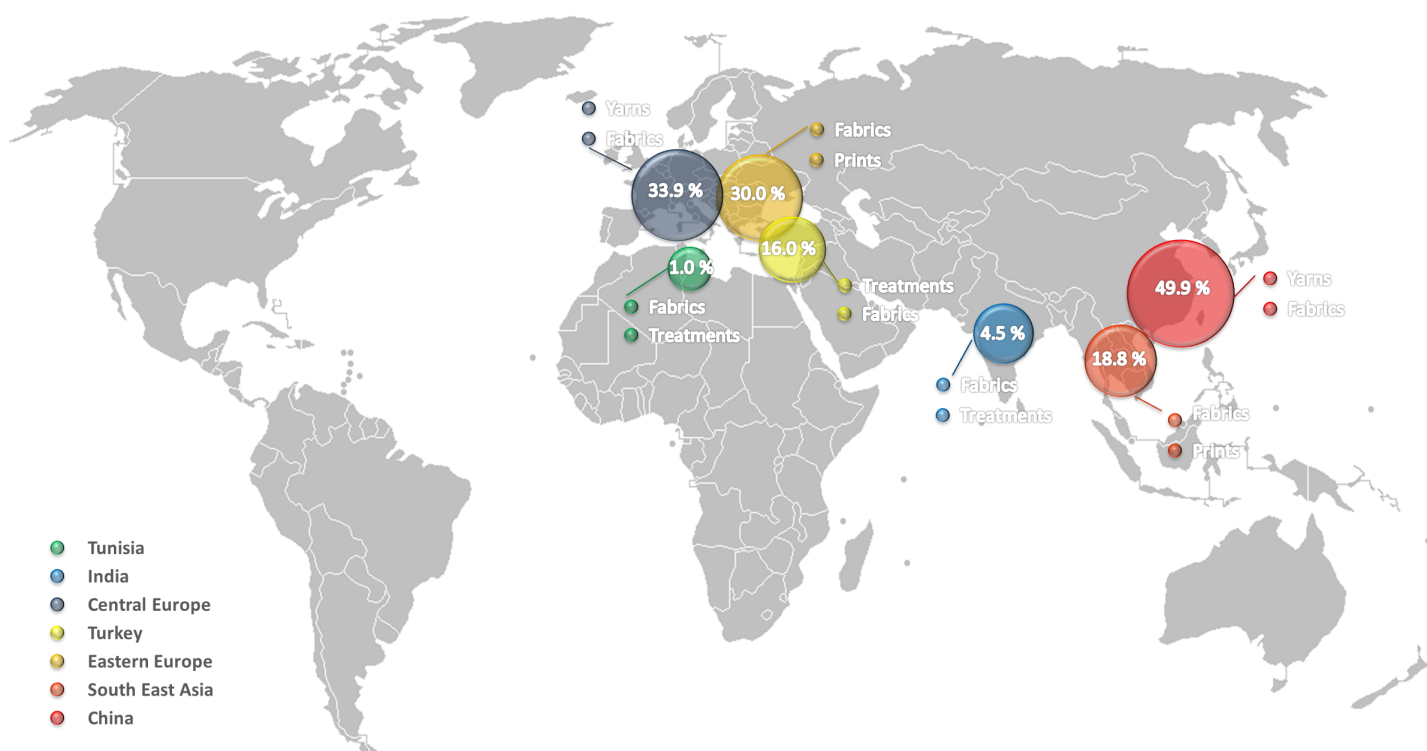


Figure 2: AP-APEOs-positive materials percentage and higher risk samples for each sourcing area

CONCLUSIONS

The steps carried out so far show that **awareness within suppliers is necessary in order to achieve the APEOs elimination**. To reach this goal, multiple actions are to be considered, including: the dissemination of specific communication to suppliers, the adoption of an even stronger contract language, the involvement of chemical suppliers and more.

Geographically speaking, the areas in which this study found the highest rates of APEOs are (often) those with the less restrictive legislation, or the ones using a high amount of imported materials from APEOs "affected" areas.

Furthermore, suppliers may unintentionally use APEOs containing chemicals due to incomplete Safety Data Sheets (SDS), making it difficult to verify the formulations: spot tests have also been conducted on chemicals said to be APEOs free, and these have sometimes resulted positive.

Due to a spread APEOs pollution, traces amounts can be easily found in incoming water and consequently in materials and products. **These unavoidable contamination sources are expected to gradually decrease due to the phase out imposed by an increasing number of Companies.** Given their water-solubility, APEOs can be used in any productive stage and washed away. Furthermore materials or products that are APEOs-positive could also not have been treated with them, suggesting that **environmental audits on facilities, including analysis on incoming and untreated discharge waters, are valid Key Performance Indicators (KPI) of APEOs use**, and can help understanding if the majority of APEOs-positive reports on materials and products, at low concentrations levels, are due to intentional use or possible cross contaminations.

Given the very high percentage of suppliers involved in APs and APEOs positive findings, the problem should be dealt with giving priority to those situations where there is the higher risk of effluent waters containing APs and APEOs effectively and

directly impacting the environment. Situations where no owned water treatment plants are available, where a failure has already been detected during materials testing or audits or in which big production orders are allocated, need to be given priority. Case studies on high failing materials and wet processes and highlighted environmental audit failures also need to be set up.

The scale of the contamination and the complexity of the problem clearly require a major involvement of all stakeholders, chemical and apparel Companies, to join forces for achieving zero discharges of hazardous substances by 2020.

To this aim, an ongoing monitoring procedure and a plan for corrective actions are implemented by Benetton Group on all the supply chain.

Identified **implementation points** and relative status:

Outputs	Status
a. Improve the traceability of materials and process facilities used in our products	✓
b. Increase APEOs chemical risk awareness within suppliers	✓
c. Strengthen suppliers contract language	✓
d. Vendor & Supplier Training	Ongoing
e. Environmental Audits and Analysis	Ongoing
f. Pilot Projects and Case Studies on relevant facilities and products	Ongoing
g. Stakeholders, Chemical and Apparel Companies involvement	Ongoing

GLOSSARY

APs: alkylphenols

APEOs: alkylphenols ethoxylates

Detection limit: specifies the test method detection sensitivity that a laboratory must be able to achieve when measuring the substance in the product.

ISO: International Organization for Standardization

KPI: Key Performance Indicators

ppm: part per million (mg/kg)

n.d.: not detected

NP: nonylphenol

NPEs: nonylphenol ethoxylates

OP: octylphenol

OPEs: octylphenol ethoxylates

SDS: Safety Data Sheets

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