CORRELATION STUDY OF CHEMICAL INPUT VS OUTPUT ON WET PROCESSES - CONCLUSIONS

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BURBERRY

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EXECUTIVE SUMMARY

It is expected that the implementation of the Manufacturing Restricted Substances List (MRSL) in wet processing sites will reduce and eliminate unwanted chemicals from the whole product lifecycle. This report concludes a study conducted with twelve of Burberry's major wet processing partners, over a period of eighteen months. Although the progressive cleansing of chemical inventories is delivering some positive results, the replacement of contaminated formulations with better alternatives is a lengthy process due to the scarcity of analytical information for commercial formulations. Incoming water and Raw Materials are carriers of some unwanted chemicals; the implementation of the MRSL across all tiers of the value chain can contribute to the complete elimination of such substances.

INTRODUCTION

As part of its commitment to eliminate the use of unwanted chemicals from the whole lifecycle and production processes, Burberry developed and shared the Manufacturing Restricted Substances List (MRSL), which details restriction limits on chemicals used in its supply chain.

Through the implementation of the MRSL, Burberry aims to eliminate unwanted chemicals from use during production, as well as reducing their release through wastewater, raw materials and finished products, progressively decreasing the environmental impact of the manufacturing processes.

This report is the second part of a study published in September 2016[1] which aims to establish whether the implementation of the MRSL is effectively driving the expected improvements.

The study involved twelve of Burberry's most important wet processing partners, representative of the most water-chemical intensive manufacturing processes in Burberry's supply chain:

- 6 Dye houses
- 2 Tanneries
- 2 Finishing houses
- 1 Laundry
- 1 Printing house

The entire chemical inventory of each facility was documented, analytically screened and wastewater tested through four different phases:

- Phase 1 – initial assessment of formulations and water prior to the implementation of the MRSL (October-November 2015)
- Phase 2 – water assessment after an initial 20% elimination of MRSL non-conformant formulations (March-April 2016)
- Phase 3 – water assessment after 70% elimination of MRSL non-conformant formulations (September-October 2016)
- Phase 4 – water assessment after 80% elimination of MRSL non-conformant formulations (February-March 2017)

This report includes an analysis of the finished product produced in the factories during the period of the study as an additional indicator of the effectiveness of the MRSL implementation.

[1] Burberry Plc website – September 2016, Case study on the correlation of input and effluent results

METHODOLOGY

During the period of analysis, the manufacturing facilities progressively cleaned their chemical inventories from formulations containing unwanted substances as identified through analytical screening. The incoming water, raw wastewater and finished products from each facility were tested in each phase for various chemical groups, to monitor the effectiveness of the cleansing over time.

The results of the study are included in Table 1 in the Annex.

It is important to note that the study focusses on seven of the sixteen chemical groups listed in the MRSL: Alkylphenol (AP) and Alkylphenol Ethoxylates (APEOs), Per- and Poly-fluorinated Chemicals (PFCs) both short chain (C6) and long chain (C6), Chlorophenols, Chlorobenzenes and Azo-dyes.

CHEMICAL INPUTS

The left side of Table 1 of the Annex, reports the testing results of chemical inputs (incoming water and chemical formulations) for each chemical group.

Incoming water

Incoming water was tested in Phase 1 and 4, assuming a constant water quality during the 4 periods of analysis. In the graphs, it is represented by a straight line which is the average concentration detected for each chemical group.

Chemical formulations

Chemical formulations were analysed using a semi-quantitative screening methodology to assess the presence of MRSL chemicals. In the graphs, the presence of specific chemical groups in the chemical formulations are represented with a bar chart.

- Phase 1 - the bar chart reports the composition of the chemical inventory after the initial screening; this represents the percentage of formulations where the specific chemical group was detected.

- Phase 4 – the bar chart reports the composition of the chemical inventory after the cleansing process. It is important to note that this data is based on a self-declaration of the facilities.

The process of cleansing is reported in figure 1.

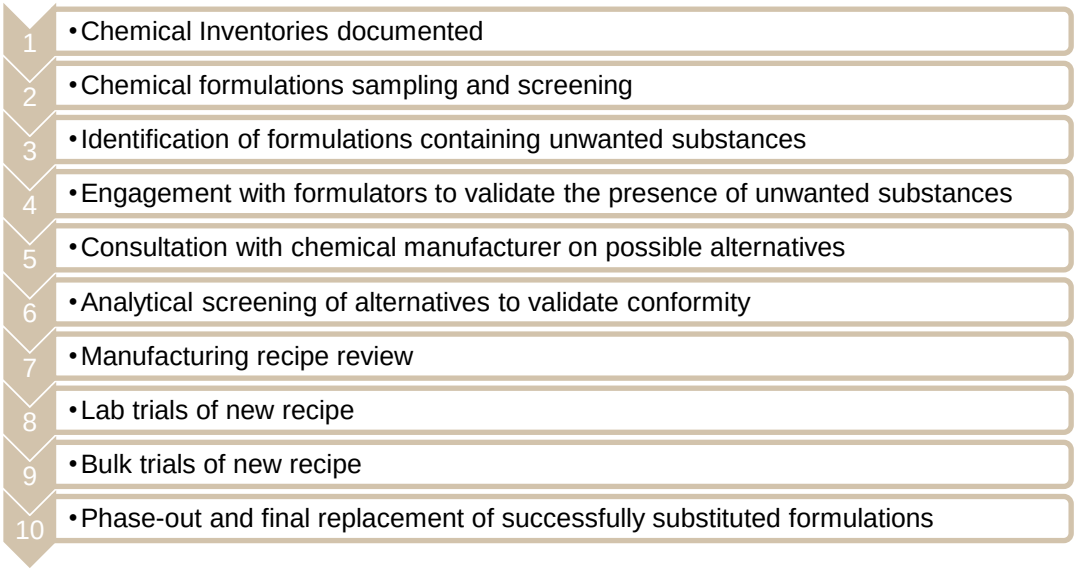


Figure 1

CHEMICAL OUTPUT

The right side of Table 1, reports the testing results of chemical outputs, such as raw wastewater and finished products. Both raw wastewater and finished products are represented considering:

- Frequency of detection over time (line graph) – calculated considering the sum of detections in the total number of tests for a specific chemical group (percentage).

- Average concentration trend over time (area) – which represents the sum of concentration of detected analytes divided by the total number of detections, for each chemical group.

Raw wastewater

Wastewater was sampled and tested in each phase after the wet process, prior to any on-site or off-site treatment, to assess the presence of unwanted chemicals. The sampling was conducted at full operating conditions of the facilities.

Finished Product

Since finished products may retain some of the unwanted substances and release them during the use and at end of life, product testing from the twelve facilities is also reported.

RESULTS

- All substances found through the formulation analytical screening are at trace levels and substantially lower than regulatory limits. The same is true for traces found on products and water.

- Finished product - five of the seven chemical groups analysed such as AP, APEO, PFC C8, PFC C6 and Azo-dyes, show an overall diminishing trend on products (ref. Table 1 A,B,C,D,G). Chlorophenols' trend is not well defined (ref. Table 1 E), while Chlorobenzenes show an increasing trend (ref. Table 1 F).

- Raw wastewater - shows a more discontinuous trend than finished product.

- Incoming water - PFCs, Chlorobenzenes and AP are present as contaminants in incoming water and this can explain their detection in outputs (ref. Table 1 A,C,D,F).

- Chemical formulations - The cleansing of the chemical inventory is still ongoing. At the time of writing, 80% of formulations containing MRSL substances have been substituted or eliminated. Chlorophenols, Chlorobenzenes and Azo-dyes are still present in chemical formulations (ref. Table 1 E,F,G). Neither AP nor APEO were detected in formulations, and this might positively reflect the effort made to date, as these chemical groups were one of Burberry's priority groups for elimination; the effect is also evident in the output (ref. Table 1 A,B). The same positive trend is shown by PFCs, both in terms of chemical formulations cleansing and the effect on output. The PFC trend clearly reflects the transition from C8 chemistry to C6 in Phase 1 and 2 (by an increasing detection trend for C6) and the total restriction of PFC from Phase 3 (which leads to a general diminishing trend for all PFCs) (ref. Table 1 C,D).

CONCLUSIONS

- Overall, the progressive cleansing of the chemical inventories through the implementation of the MRSL is delivering the expected improvements in the industrial releases and in the whole product lifecycle.

- To see the full effect on output, the cleansing should be completed, and all non-conformant formulations replaced with alternatives.

- The formulation replacement process is extremely lengthy and challenging due to the scarcity of analytical information available for commercial chemical formulations.

- It is evident that there is a need for tools to facilitate the chemical inventory cleansing process to make it quicker, traceable and reliable. Tools such as the Chemical Gateway recently created by the Zero Discharge of Hazardous Chemical group (ZDHC) will enable more informed procurement decision of chemical formulations.

- Chemical formulations or incoming water may not be the only source of unwanted substances in wastewater; there is a risk that incoming raw material contain and release these substances during processing. The upstream implementation of the MRSL is key to fully deliver the elimination of unwanted chemicals.

NEXT STEPS

Whilst this study demonstrates some encouraging trends, it is important to address some of the gaps identified, Burberry plans to do this through continuing its commitment to the following actions:

- Consistently implement and encourage due diligence testing on incoming raw materials to identify indicators of unwanted substances being used upstream in their value chain.

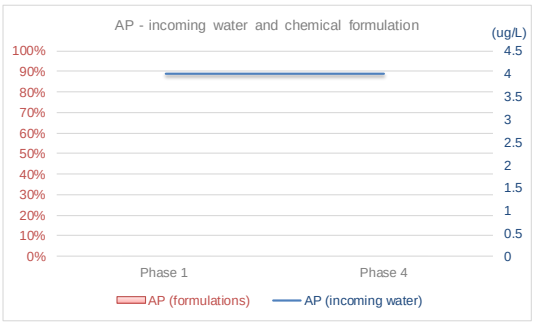
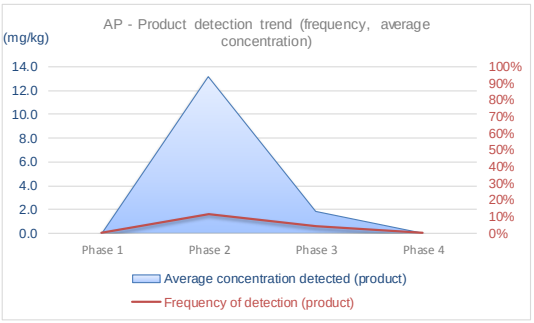
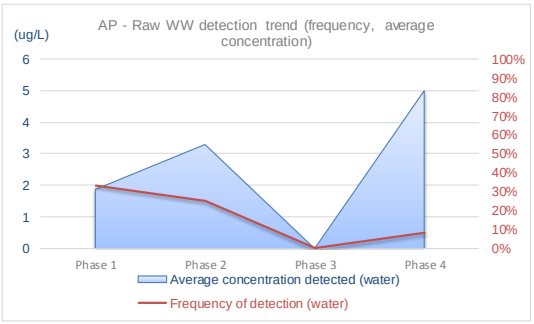
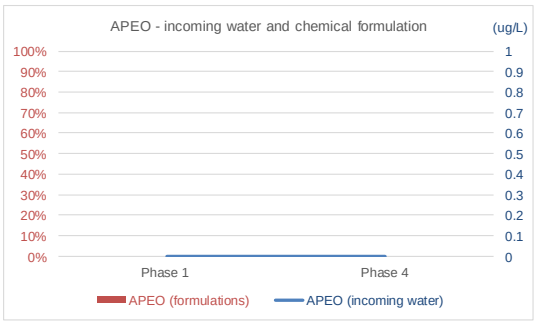
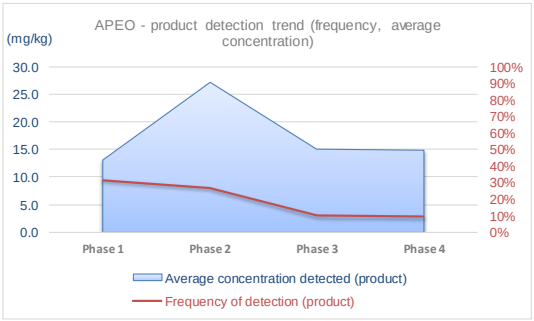
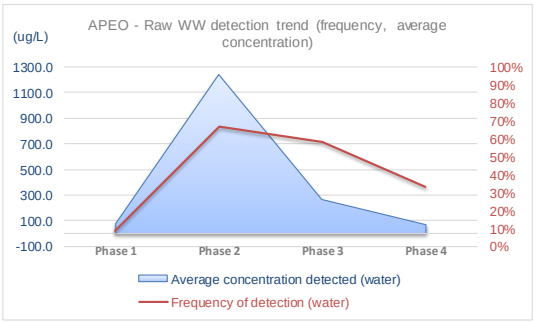
- Ensure Waste Water monitoring practices become standard practice to help Partners assess their margin for improvement through use of better chemistry and raw material procurement practices.

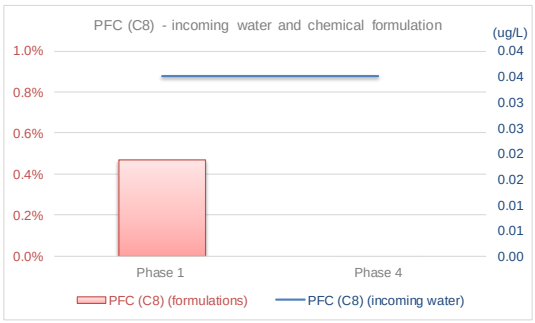
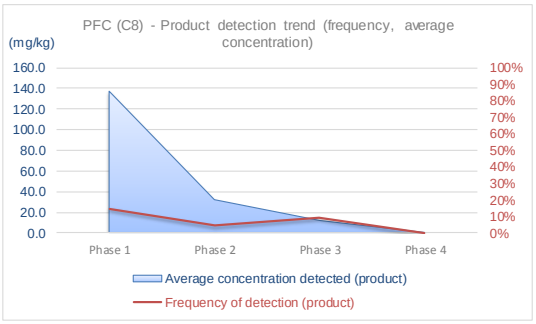
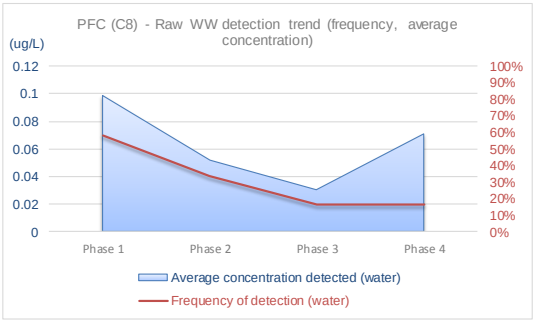
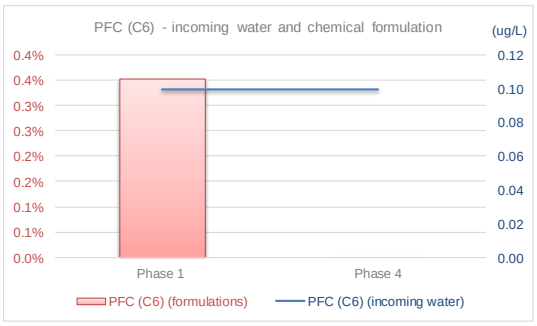
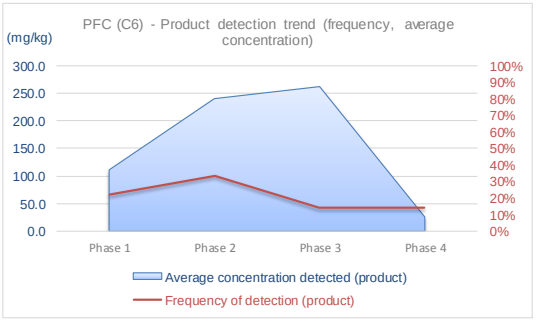
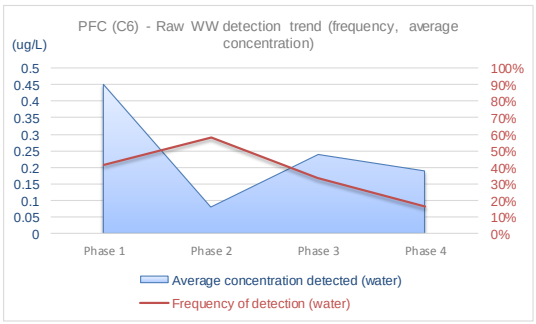
- Support the imminent launch of a tool that streamlines chemical inventory management & information sharing across the supply chain, in combination with the scale up of the formulation screening program is expected to simplify the identification of undesirable formulations and accelerate their substitution process.

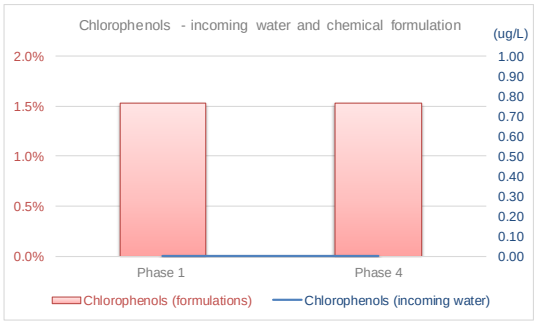
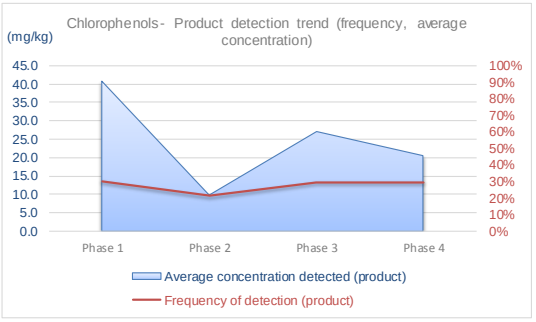
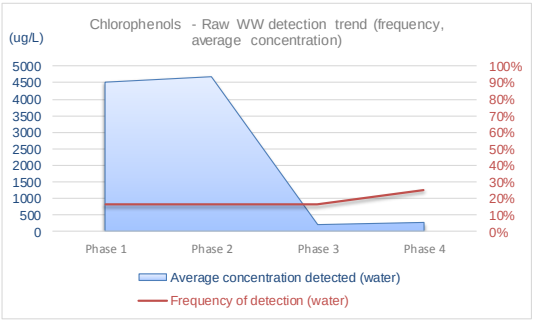
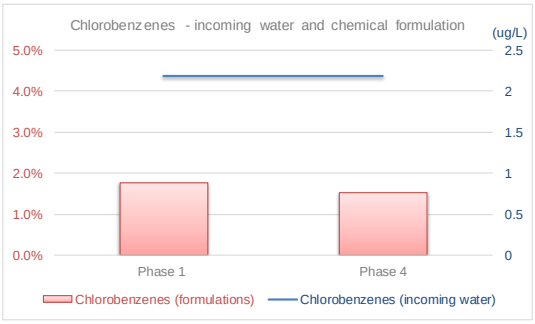
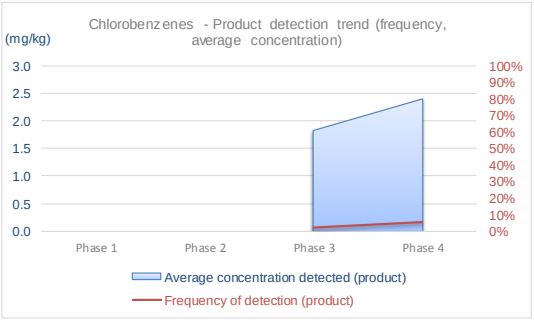
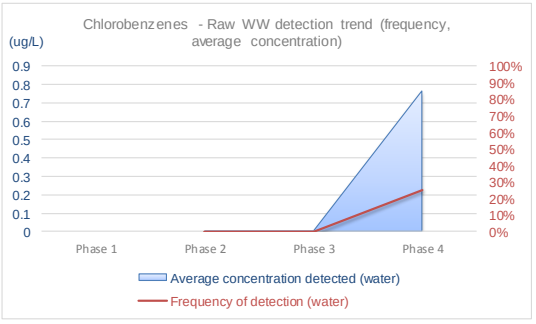
- Continuous investment in training, education, collaboration and capacity building activities is delivering outstanding results enabling the supply chain to implement the MRSL in the initial manufacturing processes of raw materials. This program (as described in the “Capacity Building of the Burberry Supply Chain through Awareness and Commitment” report https://www.burberryplc.com/content/dam/burberry/corporate/Responsibility/Responsibility_docs/Policies_statements/Chemical_Management/2017/burberry_capacity_building_report.pdf) is constantly growing the community of Chemical Managers, providing the foundation of a systematic chemical management approach (as described in the “Manufacturing Restricted Substances List Implementation Framework” https://www.burberryplc.com/content/dam/burberry/corporate/Responsibility/Responsibility_docs/Policies_statements/Chemical_Management/2017/mrsl_apr_17.pdf)

ANNEX

Table 1 – Input vs Output correlation

	Chemical Inputs	Chemical Outputs
Alkylphenol (AP)	(A) 	 
Alkylphenol ethoxylates (APEO)	(B) 	 

	Chemical Inputs	Chemical Outputs
Long Chain Per- and Poly-fluorinated Chemicals (PFC C8)	(C) 	 
Short Chain Per- and Poly-fluorinated Chemicals (PFC C6)	(D) 	 

	Chemical Inputs	Chemical Outputs
Chlorophenols	(E) 	 
Chlorobenzenes	(F) 	 

	Chemical Inputs	Chemical Outputs
Azo-Dyes	(G)