Evaluation of Process Wise ZDHC MRSL Conformance Status of Bangladesh RMG Sector

Md. Aktar Hossain
Department of Pharmacy, BGC Trust University Bangladesh

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ABSTRACT

The ZDHC Roadmap to Zero Program is a coalition of fashion brands, value chain affiliates and associates empowering the global textile, leather, apparel, and footwear value chain to substitute hazardous chemicals for safer ones in the production process. ZDHC takes a holistic, open approach, supporting safer chemical management practices across the entire value chain. By collaborating with ZDHC, organizations can mitigate risk, respond to changing customer demands, cut costs, and preserve valuable resources. Tools like CleanChain, BHIVE, BVE3 help to reduce costs and the administrative burden of collecting supply chain data by performing qualitative & quantitative analysis of chemicals. CleanChain, an ADEC Innovation, helps to automate the complex tasks of tracking, managing, and reporting compliance with Manufacturing Restricted Substance Lists (MRSLs) and Restricted Substances Lists (RSLs). In this research my objective is to identify the qualitative & quantitative analysis for the following groups of chemicals used in the different process like Alkylphenol (AP) and Alkylphenol Ethoxylates (APEOs): Including All Isomers, Anti-Microbials & Biocides, Chlorinated Paraffins, Chlorobenzenes and Chlorotoluene, Chlorophenols, Dimethyl Formamide (DMFa), Dyes – Carcinogenic or Equivalent Concern, Dyes – Disperse (Sensitizing), Dyes – Navy Blue Colorants, Flame Retardants, Glycols / Glycol Ethers, Halogenated Solvents, Organotin Compounds, Other/Miscellaneous Chemicals, Perfluorinated and Polyfluorinated Chemicals (PFCs), Phthalates – including all other esters of ortho-phthalic acid, Polycyclic Aromatic Hydrocarbons (PAHs), Restricted Aromatic Amines (Cleavable from Azo-colorants), UV Absorbers, Volatile Organic Compounds (VOC) & the impact of the un evaluated chemical which may have the following impact like Skin irritant/skin sensitizer/eye irritant Carcinogenic, mutagenic, reprotoxic Endocrine disruptors, Persistent, bio accumulative, toxic to aquatic life, Specific target organ toxic, Respiratory sensitizer, Acute toxic through oral, dermal or inhalation route, Developmental toxin/neurotoxin/impact on the central nervous system.

Keywords: ZDHC>Zero Discharge of Hazardous Chemicals, MRSL>Manufacturing Restricted Substance List, GHS>Globally harmonized System, CMS>Chemical Management System, EMS>Environmental Management System, CHA>Chemical Hazard Assessment, MSDS>Material Safety Data Sheet, OSHA>Occupational Safety and Health Administration, ANSI>American National Standards Institute, HIRA> Hazard Identification and Risk Assessment.

INTRODUCTION

The Zero Discharge of Hazardous Chemicals (ZDHC) Program is a collaboration of leading brands, value chain affiliates, and associate contributors committed to advancing towards zero discharge of hazardous chemicals in the textile, leather, and footwear value chain, thereby reducing harm to the environment and human well-being. Through its collaboration with the SAC, ZDHC assists in the development of the chemicals assessment sections of the Higg Facility Environmental Module (Higg FEM). One of the main objectives of the ZDHC Program is to reduce unnecessary duplication of audits within the textile and

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footwear value-chain. Frank Michel, executive director of ZDHC, explains that collaboration is key to achieving this goal. (SAC)

Background of the Study

The ZDHC MRSL Conformance Guidance V2.0 published by ZDHC Foundation does not guarantee the following: a. Compliance with, or to take the place of, legal or regulatory requirements. Examples might include stricter legal, local, or regional regulatory requirements on the use, storage, and transport of chemical products; or other requirements relating to the handling and disposal of chemical products, which shall supersede any requirements as set forth in this document. b. Compliance with, or conformance to, any national or international environmental or workplace safety requirements, including, but not limited to, relevant regulations and/or standards.

2. Nor do the ZDHC MRSL Conformance Guidance V2.0 replace any national or international environmental or workplace safety requirements including, but not limited to, regulations and/ or standards. The ZDHC MRSL Conformance Guidance V2.0 is not intended nor can be used as a statement of legal requirements. ZDHC refers to the UN GHS (Globally Harmonized System of Classification and Labelling of Chemicals) as the internationally recognized standard for hazardous material classification and labelling. All the other National/Regional existing schemes, derived from the implementation of the GHS, must be considered included in the list of the accepted ZDHC standards for this purpose. To simplify the ZDHC MRSL Conformance Guidance V2.0 comprehension, ZDHC uses GHS throughout as its reference for Hazard Statements and Pictograms in SDS and labels to avoid local variables. (ZDHC MRSL Conformance guidance)

ZDHC has made every reasonable effort to make sure that the content and information contained in the ZDHC MRSL Conformance Guidance V2.0 is as accurate and correct as possible at the time of publication. ZDHC makes no claims, promises, or guarantees about the accuracy, completeness, or adequacy of the contents of this document. In no event will ZDHC (and/or any related ZDHC majority owned legal entities) or the Directors or staff thereof be liable and ZDHC expressly disclaims any liability of any kind to any party for any loss, damage, or disruption caused: a. By errors or omissions, whether such errors or omissions result from negligence, accident, or any other cause and/or; b. From any use, decision made, or action taken or any other kind of reliance on the ZDHC MRSL Conformance Guidance V2.0 by a reader or user of it and/or; c. For any results obtained or not obtained from the use of the ZDHC MRSL Conformance Guidance V2.0. For the avoidance of doubt this Disclaimer applies to all related documents produced by ZDHC, specifically: ZDHC Wastewater Guidelines, ZDHC Sludge Reference Document, ZDHC Wastewater and Sludge Laboratory Sampling and Analysis Plan and ZDHC Wastewater Industry Implementation Approach, etc. (ZDHC MRSL Conformance guidance 2022)

Objectives of the study:

1. To identify the present status of the ZDHC MRSL conformance chemicals used at different process in
2. To evaluate the input of green chemistry & discharge of cleaner emission at RMG
3. To identify the qualitative & quantitative status of the chemical used at different process of RMG
4. To identify the possible impact of unevaluated/locally purchased
5. To identify the possible risk & health safety status of the workers who are directly handling the

LITERATURE REVIEW

There are three levels of ZDHC MRSL Conformance. ZDHC MRSL Conformance Levels 1-3 give a confidence rating that this requirement would be met consistently as we go from Level 1 to 3. More details are available at higher levels of ZDHC MRSL Conformance, which demonstrate a continuous production of

chemical formulations according to responsible manufacturing practices and consistent conformance to the applicable ZDHC MRSL Guideline.

Requirements for ZDHC MRSL Conformance Levels:

- Level 1 – document review of SDS for information relevant to ZDHC MRSL and testing of the formulation which includes screening and analytical testing or only analytical testing.
- Level 2 – onsite assessment of management systems plus evidence that Level 1 principles of analytical evaluation for ZDHC MRSL conformance are fulfilled.
- Level 3 – chemical hazard assessment capability plus evidence that Level 1 and Level 2 principles for ZDHC MRSL conformance are fulfilled. (ZDHC MRSL Conformance guidance 2022)

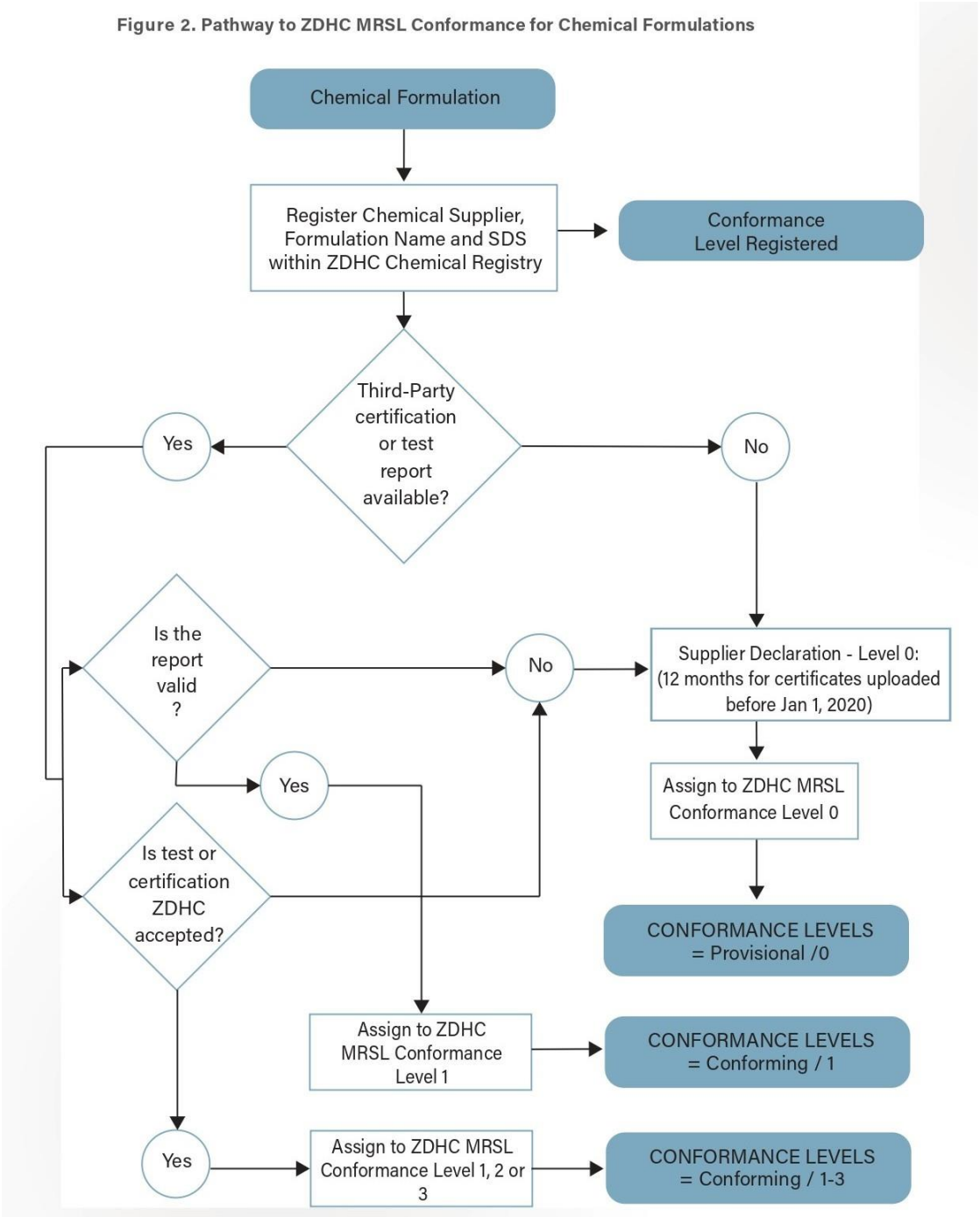

Figure 1: Pathways of ZDHC MRSL conformance (ZDHC MRSL Conformance guidance 2019)

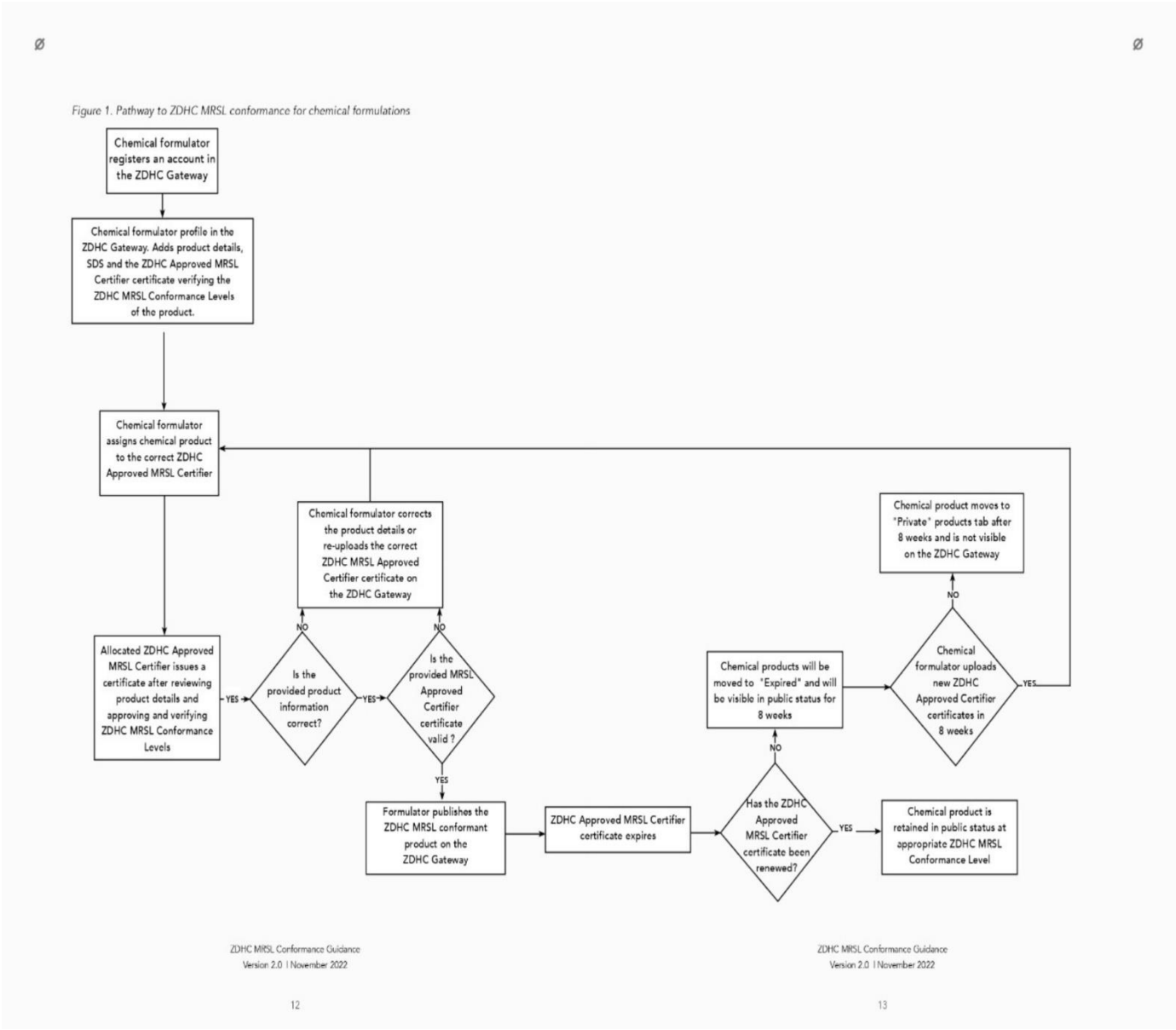

Figure 2: Figure 1: Pathways of ZDHC MRSL conformance (ZDHC MRSL Conformance guidance 2022)

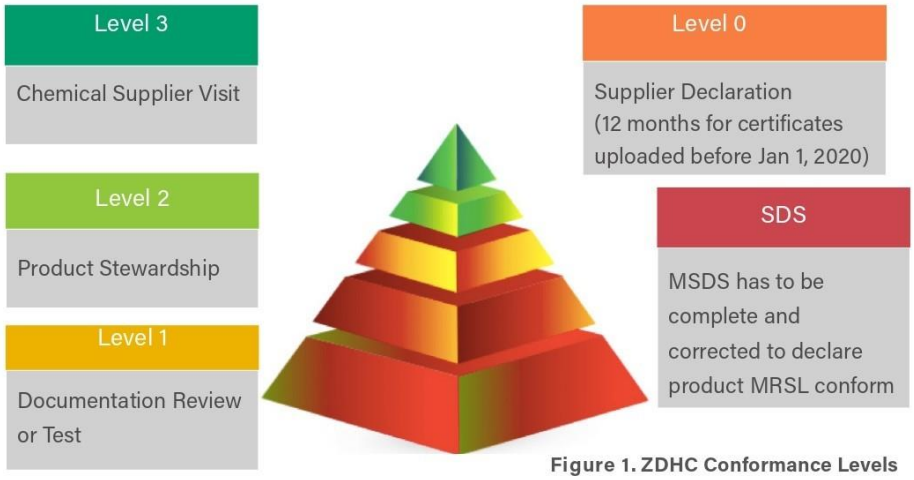

Figure 3: ZDHC MRSL conformance level (ZDHC MRSL Conformance guidance 2019)

Table 1. Requirements for Registration and MRSL Conformance Levels

MRSL Conformance Level	Register Chemical Supplier with ZDHC Gateway - Chemical Module	Register Formulation Name and SDS with ZDHC Gateway - Chemical Module	Self-declaration of MRSL Conformity	Test report meeting ZDHC Quality Criteria (Annex A)	Third-party review of documentation against MRSL	Chemical Supplier Product Stewardship Review	Chemical Supplier Site Visit
Registered	X	X					
0	X	X	X				
1	Automatic when formulation certified by ZDHC accepted body		As required by certification body	Test report OR third-party review of documentation			
2				As required by certification body	X	X	
3					X	X	X

Figure 4: ZDHC MRSL conformance level (ZDHC MRSL Conformance guidance 2019)

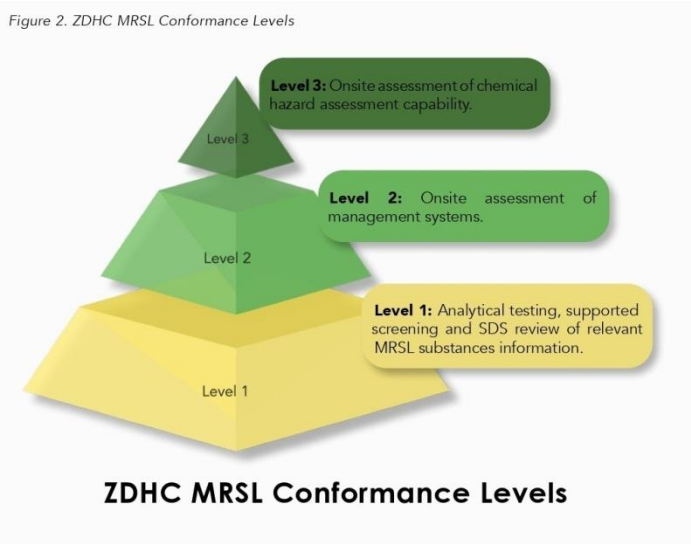

Figure 5: ZDHC MRSL conformance level (ZDHC MRSL Conformance guidance 2022)

ZDHC MRSL Conformance Level 1 is based on analytical testing of the chemical formulation for MRSL risks. An analytical test report from a ZDHC Approved Laboratory accredited for ISO 17025 with proper scope is required as evidence of ZDHC MRSL conformance for impurities. A screening analysis by gas chromatography/mass spectrometry (GC/MS), liquid chromatography/mass spectrometry (LC/MS), or inductively coupled plasma (ICP), or any other advanced detection equipment, can also be done to help determine addition of ZDHC MRSL substances.

The ZDHC MRSL Level 1 Conformance is accomplished by having a certification for the chemical formulation from a ZDHC Approved Certifier based on:

1. Review of a valid safety data sheet (SDS) for information on ZDHC MRSL substances (such as section 3 of GHS SDS) to determine ZDHC MRSL risks for analytical testing of the formulation (and to check potential presence of substances in the ZDHC MRSL Archived List). The SDS should be prepared according to American National Standards Institute (ANSI) Z400.1/Z129.1-2010, International Organization for Standardization (ISO) 11014(1), European Commission (EC)

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1272/2008 Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH), Globally Harmonised System (GHS), or Japanese Industrial Standards (JIS) Z 7253:2012. The review of SDS will support and integrate into the professional judgement of the ZDHC Approved MRSL Certifier for analytical testing.

2. Analytical testing for ZDHC MRSL substances by the certifier using professional judgement, Appendix A (Smart Testing Grid) and methods recommended in ZDHC MRSL version 3.0 to select the test parameters. ZDHC Approved Certifier selects the appropriate testing and declares chemical formulation meets the requirement of the ZDHC MRSL based on the testing performed and review of information in SDS. A certifier shall not declare conformance of a formulation to ZDHC MRSL based on testing conducted on parameters selected by the chemical formulator.
3. A screening analysis from the ZDHC Approved MRSL Certifier such as GC/MS, LC/MS, ICP, or any other advanced detection equipment, to identify ZDHC MRSL failures caused by the intentional addition of ZDHC MRSL substances or inactive substances in the chemical formulation. Laboratories are encouraged to conduct screening analysis to support their professional judgement to determine analytical tests for ZDHC MRSL risks in the chemical product.
4. The length of validity for the certification depends on the ZDHC MRSL Approved Certifier. However, in case of revision in the ZDHC MRSL version during the validity period of the certification, the formulation should be re-certified to the latest ZDHC MRSL version by the ZDHC MRSL Approved Certifier within the transition period. The certifier must demonstrate a process of being notified by the formulator of any change in composition or production process of the certified formulation during the validity period. In such a case, a chemical formulator must provide an updated SDS and the certifier can decide whether re-evaluation is required.

ZDHC MRSL Conformance Level 2 requires:

- Evidence that Level 1 principles of analytical evaluation for ZDHC MRSL conformance are fulfilled, including making available on the ZDHC Gateway a GHS or equivalent SDS or a link to the company website to access the specific SDS.
- Onsite visit to the chemical formulation facility to evaluate the management systems including environmental management system (EMS), occupational health and safety management system (OHSMS), raw material management system, quality management system (QMS), chemical management system (CMS) and appropriate wastewater and solid waste management systems by the ZDHC Approved MRSL Certifier. If the same product is manufactured in multiple locations, it is preferable that all the production facilities be audited or, in any case, evaluated for ZDHC MRSL Conformance Level 2 requirements.
- Demonstration of executive-level commitment to protect the environment, worker health and safety, preferably by any of the below:

» Evidence that manufacturing is conducted according to ISO (or equivalent) standards for QMS and EMS.

» Policy related statement on the website or in the annual report to highlight all commitments.

» A commitment to apply a common global standard to products, such as conformance to ZDHC MRSL.

» Commitment to industry initiatives, such as Responsible Care©, by direct membership or through membership of a trade association aligned to such initiatives.

» Commitment to implementing a robust process that ensures any chemical formulations which are not conformant to ZDHC MRSL are clearly identified and cannot directly, or via third-party sales channels, be used for production intended to be conformant to ZDHC MRSL requirements.

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» External assessments such as Dow Jones Sustainability Index, B Corp, and Global Reporting Initiative (GRI)

ZDHC MRSL Conformance Level 3 requires evidence that the principles of analytical testing for ZDHC MRSL Conformance Level 1 and the principles of management systems for Level 2 are being achieved. Additionally, a review of the chemical hazard assessment (CHA) capability of the formulator will form an attribute of this ZDHC MRSL conformance level.

CHA capability includes the ability to assess and interpret diverse toxicological and other health and environmental information for classification and labelling of a formulation in accordance with GHS as required. This expertise can be in-house or subcontracted to a consultant. This may include but is not limited to:

- The formulator should be able to provide complete and correct data as well as a standard methodology for hazard profiling of a formulation, including assessment for ZDHC MRSL and other relevant authoritative lists such as ECHA, CLP, REACH, IARC, Toxic Substances Control Act (TSCA) etc.
- Streamlining with positive lists such as Safer Chemical Ingredients List of United States Environment Protection Agency (US EPA). • Active tracking of the applicable legislation on chemical restrictions for all relevant sales jurisdictions and communication of appropriate information to downstream users.
- Expertise in authoring SDS, including the capability to translate into country-specific SDS formats (preferably IT-supported).
- Expertise in Transport of Dangerous Goods classification to provide appropriate transport information in Section 14 of a GHS conformant SDS.
- Reformulation capability to identify safer (less hazardous) alternatives to substances of concern and to successfully reformulate.

This includes:

» Demonstrate chemical and application expertise to evaluate the performance of the reformulated product(s) and evidence of implementation.

» Demonstrable capability to evaluate the replacement of substances of concern with safer alternatives according to current best practices such as;

- OECD (2021), Guidance on Key Considerations for the Identification and Selection of Safer Chemical Alternative.
- OECD Series on Risk Management, No. 60, Environment, Health and Safety, Environment Directorate, OECD (CB) National Research Council 2014 – A Framework to Guide Selection of Chemical Alternatives. Washington, DC: The National Academies Press.
- Interstate Chemicals Clearinghouse (IC2), 2017: Alternatives Assessment Guide Version 1.1

» Keep a database of full product composition for all formulations.

» Demonstrate change management capability in case of new regulations and new hazard classification of substances.

» Have data on the possible safer alternatives, their application, and the corresponding performance results. (ZDHC MRSL Conformance guidance 2022)

MATERIALS AND METHODS

Study Area

Serial No	Sample Collection	Sample Collection Technique	Location
1	Sample One	Washing	Narayanganj
2	Sample Two	Dyeing	Mawna, Gazipur
3	Sample Three	Rotary Printing	Mogorkhal, Gazipur
4	Sample Four	Flat Bed Printing	OLD DEPZ, Savar
5	Sample Five	All Over Printing	Shafipur, Gazipur
6	Sample Six	Screen Print	Hemayetpur, Savar

Table 1: Sample collection facilities & location

The research was designed analyzed in the chemical using facilities in bangladesh.

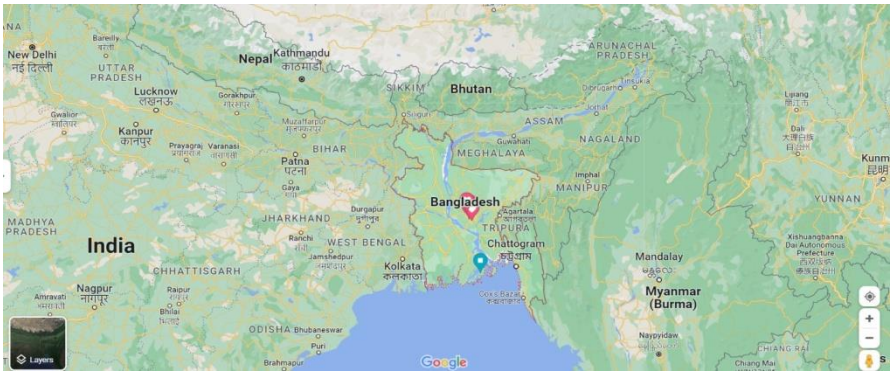


Figure 6: Google Map of the research area.

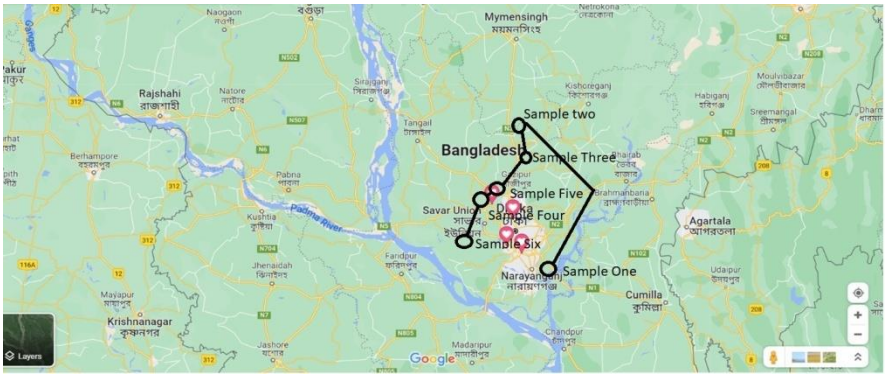
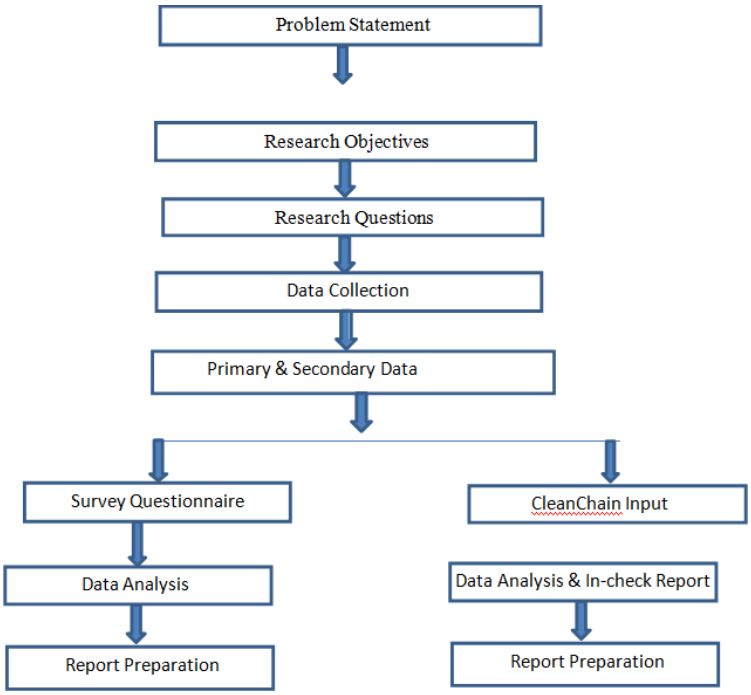


Figure 7: Google Map of the sample collection location

Research Design:

The nature of the present research is exclusively a qualitative & quantitative analysis of the chemicals with the exposure impact which have been used in the RMG facilities. Although this research study broadly falls under analytical study, but basically qualitative & quantitative data were used in this study. An analytical tool named CleanChain was used to analyze the data.

All the qualitative & quantitative data of the chemicals & MSDS have been used in the different process of the facilities were collected & inputted in the analytical tool named CleanChain.



Sampling Technique:

The research was conducted in the following locations like Narayanganj, Mawna, Gazipur Mogorkhal, Gazipur, OLD DEPZ, Savar, Shafipur, Gazipur & Hemayetpur, Savar based on the RMG process wise chemical using facility like washing, dyeing, AOP, Flat bed printing, Rotary Printing, Screen Printing process. There are various group of chemicals have been used in the mention processes like softener, Catalyzer, Enzyme, bleaching powder, printing ink, different dyes, Caustic soda, acids & bases etc., among those chemicals almost 1088 chemical has been selected for this research.

Sources of data:

This study was basically based on the information collected from personal observation, informal conversation with workers, and face to face interview with the respective officers and staffs of the organization & collecting the chemical inventories with MSDS. Secondary data sources were also used in the present study to compare the observed situation with the necessary laws and rules. These sources are discussed below:

Primary sources

Secondary sources

Primary sources

Primary sources: Chemical Inventory & MSDS Collection, Personal observations, management face to face interview & documentation review.

Secondary sources:

Secondary sources: Zero Discharge of Hazardous Chemical-Verson 1.1, 2.0 & 3.0 MRSL guideline. MRSL conformance guideline. CleanChain strategical guideline.

Processing and analyzing data:

All the data were processed and analyzed through ZDHC approved MRSL conformance analytical tool

named Clean Chain, Graphical processing with software (MS Word).

RESULTS AND DISCUSSION

Sample one is using almost 169 chemicals in the production area. Among the 169 chemicals followings are percentage of qualitative MRSL status analysis

Percentage	MRSL STATUS
43.2%	Not Evaluated chemicals
17.8%	Level-3 chemical
6.5%	Level-1 chemical
1.2%	Level-0 chemical
4.19%	Formulator declared conformant
27.2%	Crowd sourced chemical

Table 2: Qualitative data of input chemical (sample one)

Facility has used a total volume of 991874.71 kg of chemicals in the production areas. Followings are the volumetric MRSL status analysis of the total volume.

MRSL STATUS	Volume
Not Evaluated chemicals	830293.22kg
Level-3 chemical	49292.82 kg
Level-1 chemical	59422.13 kg
Level-0 chemical	7506.02 kg
Formulator declared conformant	3042.23 kg
Crowd sourced chemical	42318.29 kg

Table 3: Quantitative data of input chemical (sample one)

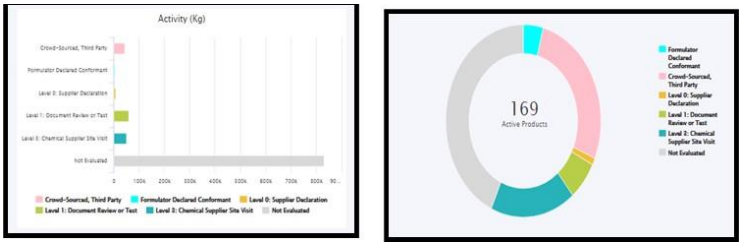


Figure 8. Qualitative & quantitative analysis of the MRSL status for the sample One.

Sample two is using almost 177 chemicals in the production area. Among the 177 chemicals followings are percentage of qualitative MRSL status analysis

Percentage	MRSL STATUS
45.2%	Not Evaluated chemicals
16.9%	Level-3 chemical
6.2%	Level-1 chemical
1.1%	Level-0 chemical
4.5%	Formulator declared conformant

26.0%	Crowd sourced chemical

Table 4: Qualitative data of input chemical (sample two)

Facility has used almost 699307.2 kg of chemicals in the production area. Followings are the volumetric MRSL status analysis of the total volume.

MRSL STATUS	Volume
Not Evaluated chemicals	160037.25 Kg
Level-3 chemical	44882.24 Kg
Level-1 chemical	604038.20 Kg
Level-0 chemical	5966.37 Kg
Formulator declared conformant	3572.88 Kg
Crowd sourced chemical	40847.46 Kg

Table 5: Quantitative data of input chemical (sample two)

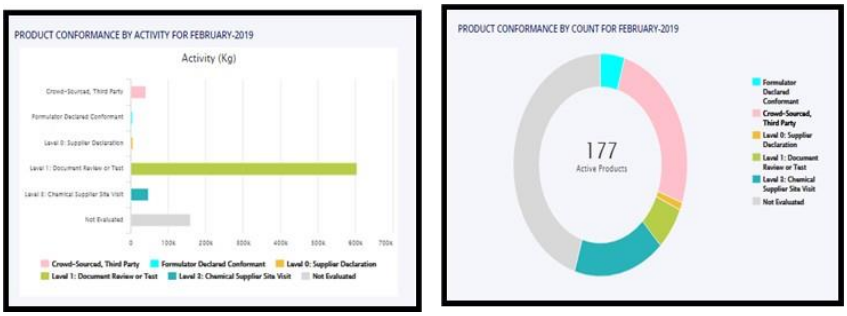


Figure 9. Qualitative & quantitative analysis of the MRSL status for the sample two.

Sample three is using almost 180 chemicals in the production area. Among the 180 chemicals followings are percentage of qualitative MRSL status analysis

Percentage	MRSL STATUS
42.2%	Not Evaluated chemicals
16.7%	Level-3 chemical
6.1%	Level-1 chemical
1.1%	Level-0 chemical
5.0%	Formulator declared conformant
28.3%	Crowd sourced chemical

Table 6: Qualitative data of input chemical (sample three)

Facility has used almost 525299.3 kg of chemicals in the production area. Followings are the volumetric MRSL status analysis of the total volume.

MRSL STATUS	Volume
Not Evaluated chemicals	148767.56 Kg
Level-3 chemical	45108.58 Kg
Level-1 chemical	429876.11 Kg
Level-0 chemical	4307.21 Kg

Formulator declared conformant	3709.48 Kg
Crowd sourced chemical	42297.91 Kg

Table 7: Quantitative data of input chemical (sample three)

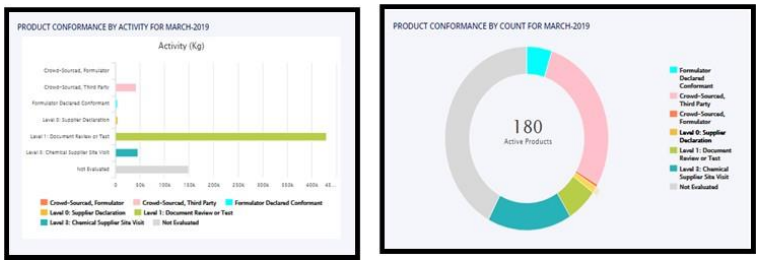


Figure 10. Qualitative & quantitative analysis of the MRSL status for the sample three.

Sample four is using almost 190 chemicals in the production area. Among the 190 chemicals followings are percentage of qualitative MRSL status analysis

Percentage	MRSL STATUS
43.2%	Not Evaluated chemicals
15.3%	Level-3 chemical
7.4%	Level-1 chemical
1.1%	Level-0 chemical
5.8%	Formulator declared conformant
27.4%	Crowd sourced chemical

Table 9: Qualitative data of input chemical (sample four)

Facility has used almost 434691.8 kg of chemicals in the production area. Followings are the volumetric MRSL status analysis of the total volume.

MRSL STATUS	Volume
Not Evaluated chemicals	119632.18 Kg
Level-3 chemical	33018.72 Kg
Level-1 chemical	235813.60 Kg
Level-0 chemical	1507.35 Kg
Formulator declared conformant	3726.34 Kg
Crowd sourced chemical	40993.63 Kg

Table 10: Quantitative data of input chemical (sample four)

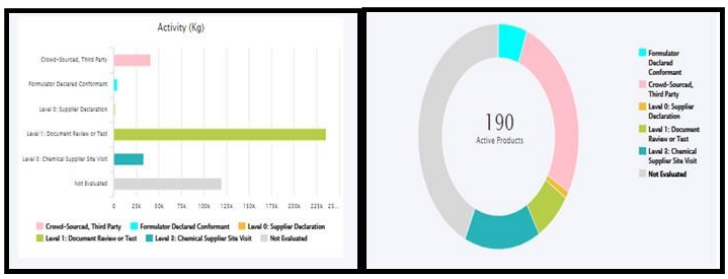


Figure 11: Qualitative & quantitative analysis of the MRSL status for the sample four.

Sample five is using almost 202 chemicals in the production area. Among the 202 chemicals followings are percentage of qualitative MRSL status analysis

Percentage	MRSL STATUS
48%	Not Evaluated chemicals
15%	Level-3 chemical
7%	Level-1 chemical
1%	Level-0 chemical
5%	Formulator declared conformant
24%	Crowd sourced chemical

Table 11: Qualitative data of input chemical (sample five)

Facility has used almost 434691.8 kg of chemicals in the production area. Followings are the volumetric MRSL status analysis of the total volume.

MRSL STATUS	Volume
Not Evaluated chemicals	172091.53 Kg
Level-3 chemical	29191.61 Kg
Level-1 chemical	116101.94 Kg
Level-0 chemical	467.61 Kg
Formulator declared conformant	2603.61 Kg
Crowd sourced chemical	30975.57 Kg

Table 12: Quantitative data of input chemical (sample five)

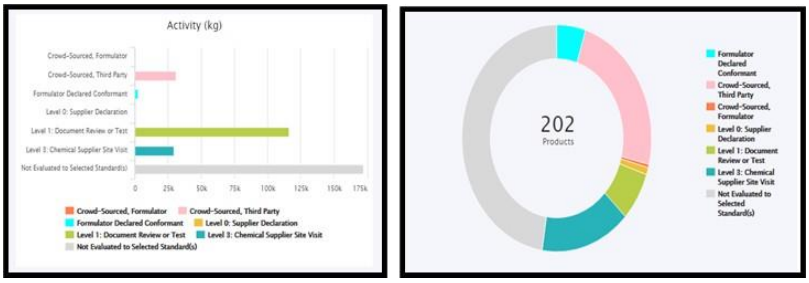


Figure 12: Qualitative & quantitative analysis of the MRSL status for the sample Five.

Sample six is using almost 170 chemicals in the production area. Among the 170 chemicals followings are percentage of qualitative MRSL status analysis

Percentage	MRSL STATUS
28%	Not Evaluated chemicals
8%	Level-3 chemical
3%	Level-1 chemical
0%	Level-0 chemical
1%	Formulator declared conformant
60%	Crowd sourced chemical

Table 13: Qualitative data of input chemical (sample six)

Facility has used almost 335936.6 kg of chemicals in the production area. Followings are the volumetric MRSL status analysis of the total volume.

MRSL STATUS	Volume
Not Evaluated chemicals	93786.15 Kg
Level-3 chemical	27059.88 Kg
Level-1 chemical	9421.26 Kg
Level-0 chemical	384.96 Kg
Formulator declared conformant	3986.06 Kg
Crowd sourced chemical	201298.29 Kg

Table 14: Quantitative data of input chemical (sample six)

Figure 13: Qualitative & quantitative analysis of the MRSL status for the sample Six.

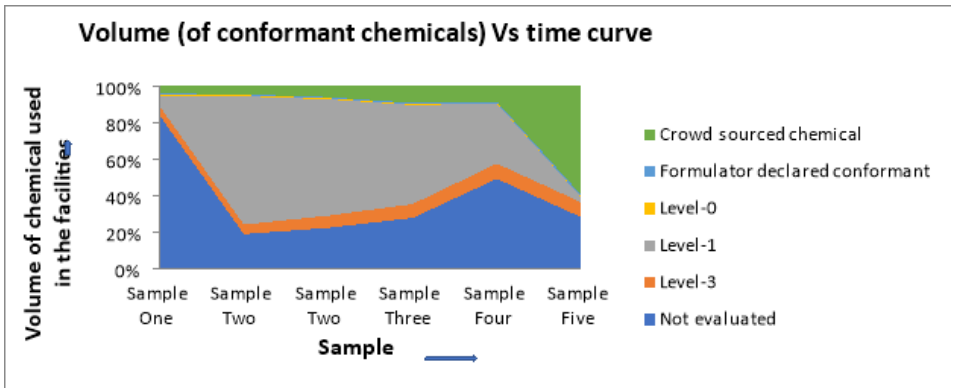


Figure 14: Summary of quantitative analysis of the MRSL status for all Sample.

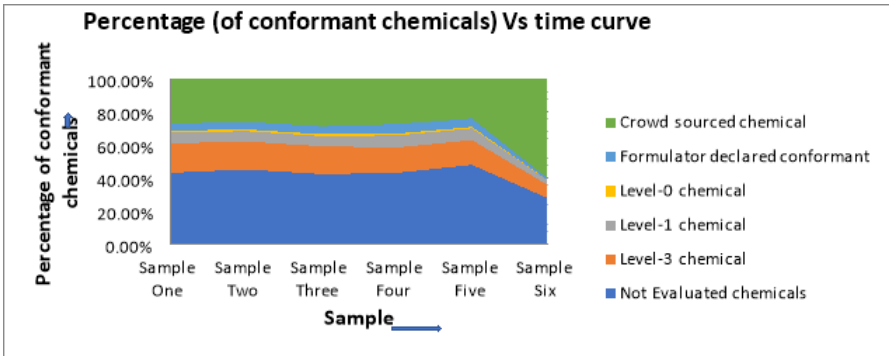


Figure 15: Summary of qualitative analysis of the MRSL status all Sample

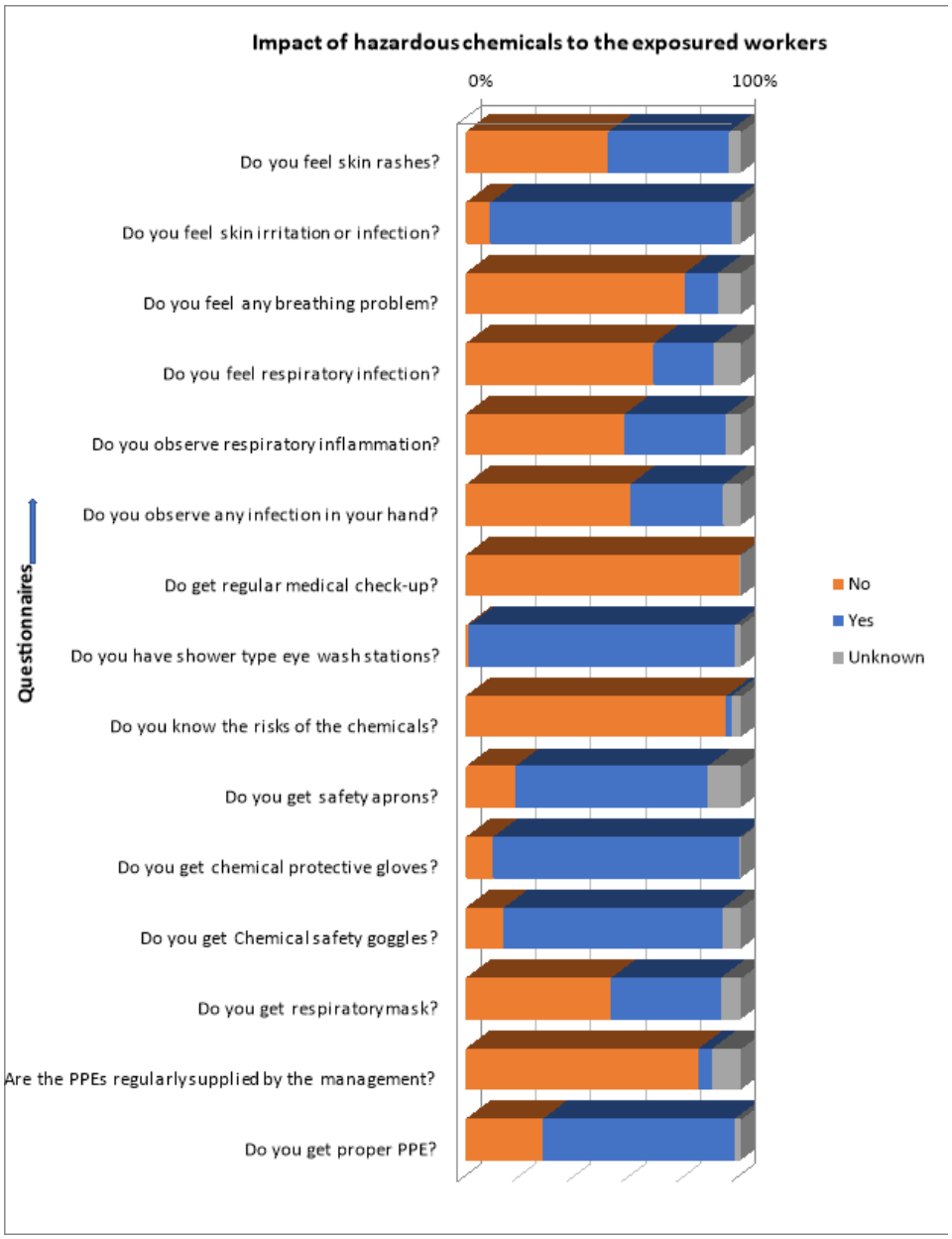


Figure 16: Opinion of workers regarding chemical use risk & health safety.

Impacts of ZDHC Non-Conformant chemicals:

- After a long study from different areas & processes it was observed that most of the chemicals are not evaluated and manufacturers are not interested enough to provide the full materials disclosure with CAS number of the mixture of chemicals & hence may contain any of the 1A-T group hazardous chemicals.
- These group chemicals are highly harmful for the environment & human body as well. Since the workers are either wearing no PPE or not getting proper PPE, so they are in the high risk of
- Skin irritant/skin sensitizer/eye irritant Carcinogenic, mutagenic, reprotoxic Endocrine disruptors, Persistent, bio accumulative, toxic to aquatic life, Specific target organ toxic, Respiratory sensitizer, Acute toxic through oral, dermal or inhalation route, Developmental toxin/neurotoxin/impact on the central nervous system.
- Since most of the chemicals are not evaluated, So the Product RSL may be failed & ETP discharged water may contain hazardous chemicals.
- Neither the input of green chemistry is ensured, nor the environment friendly emission is discharged.

CONCLUSION

The facilities are committed to ensure the 100% ZDHC MRSL Version 3.0 conformant chemicals but there is a huge challenge because some of the renowned manufacturers are not interested enough to disclose full materials disclosure with proper CAS number either for business secrecy or for financial approach. Another challenge is the importers & suppliers are not transparent enough, they are importing the chemicals 'intact' but supplying the chemicals after diluting or re-mixing. However, most of the manufactures are evaluatingtheir chemicals with a third party certification body & ensuring ZDHC conformance & most of the facilities already have started to purchase intact chemicals by their own purchasing system to ensure 100% ZDHC conformance.

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APPENDIX

Survey questionnaire

Questionnaire for identifying impact of hazardous chemicals.			
SI No.	Questions	Respondent's opinion	
		Yes	No
1	Do you get proper PPE?		
2	Are the PPEs regularly supplied by the management?		
3	Do you get respiratory mask?		
4	Do you get Chemical safety goggles?		
5	Do you get chemical protective gloves?		
6	Do you get safety aprons?		
7	Do you know the risks of the chemicals?		
8	Do you have shower type eye wash stations?		
9	Do get regular medical check-up?		
10	Do you observe any infection in your hand?		
11	Do you observe respiratory inflammation?		
12	Do you feel respiratory infection?		
13	Do you feel any breathing problem?		
14	Do you feel skin irritation or infection?		
15	Do you feel skin rashes?		