BD Technology

15, New Bailey Road, Building # 2, (2nd Floor), Dhaka-1000
Mobile: +8801670 999900, Tel: +880-2-8321823, Fax +880-2- 8321823
E-mail:info@bdtechnology.net, bdtechnology@gmail.com
Web: www.bdtechnology.net

Executive Summary:

Knit-Concern Printing Unit is a knit fabric Printing mill having installed production capacity of 150000 pcs/day or 2.5 ton/day. Presently, the average production is around 120000 pcs/day or 2.2 ton/day. The raw material of this mill is knitted cut pcs. The factory is producing different types of print like Pigment print, Rubber print, Discharge print, Puff print, Metallic print, Glitter print, High-density print, Flock print, Foil print, Sticker print, Sublimation, Digital print, Plastisol print etc.

The printing unit runs approximately 345 days in a year and has 1 shifts of 8 hours per day. Total 500 workers are engaged in printing section.

The water consumption summary is given below:

Parameter	Unit	Annual consumption (based on 2016-17 data)	Remarks
Water consumption	m^3/year	9140	Based on water flow meter readings available and on-site data taken at factory

The cleaner production assessment team has established the current baseline performance or KPI's of the factory based on available data of year 2016-17 and on site measurements taken during assessment periods. The major KPI's are given below.

SL_N	Area	Parameter	Current KPI	Remarks
1	**Printing process**	Water consumption/unit printing knitted fabric	2.74 liter/kg	Water flow meters are available at ETP outlet, deep pump & WTP
2	**Water Footprint**	Blue water footprint for the factory	29.296 m^3/day	

Metering, data collection & analysis:

The factory has installed water flow meters to calculate Process water and Domestic water. Data is captured from those meters but no water balance diagram and water consumption analysis had been established by factory management in the past.

15, New Bailey Road, Building # 2, (2nd Floor), Dhaka-1000
Mobile: +8801670 999900, Tel: +880-2-8321823, Fax +880-2- 8321823
E-mail:info@bdtechnology.net, bdtechnology@gmail.com
Web: www.bdtechnology.net

Process:

Based on assessment activities, WA Team have some general observations on production facilities and on process managements:

- The KPI's established and notably the water consumption for Printing. The water consumption data is derived from process flow analysis and requires further analysis to have an authentic baseline.
- The printing machines are modern and manufactured within a period of 2006-07.
- Overall, there is a scope for developing KPI in process management to understand the process capabilities and look forward to continuous improvement.

WASH:

The factory has an operating structure considering Water Sanitation & Hygiene (WASH). The factory is in agreement with the regulatory requirements of providing drinking water facility and the toilet facilities. However some areas can be improved such as review the need for additional drinking water points at process, ensuring hand wash materials in washrooms and toilets, strong monitoring on cleaning activities and raising awareness among workers on hygiene practices etc. The factory is advised to follow ILO standards for toilets and ECA1995 & ECR1997 for drinking water quality.

ETP:

Factory operates one ETP (chemical) with a capacity of 1 m^3/hr. Some parameters (pH, DO, TDS) of ETP inlet and outlet water are checked in-house at a regular frequency and all parameters are checked from external sources (BV, DOE). Both on-site and external results confirm the wastewater parameters within the acceptable limits as stated by DOE, Bangladesh.

Assessment outcomes:

The Water Audit Assessment at Knit-Concern Printing Unit showed that significant reduction can be achieved in water (10%). Based on the findings of the WAA, the consortium identified 2 cost-effective measures for achieving significant water reduction.

15, New Bailey Road, Building # 2, (2nd Floor), Dhaka-1000
Mobile: +8801670 999900, Tel: +880-2-8321823, Fax +880-2- 8321823
E-mail:info@bdtechnology.net, bdtechnology@gmail.com
Web: www.bdtechnology.net

The summary is given below:

Area	Total number of options	Estimated investment, *USD	Economic benefits, USD/year	Environmental benefits/year
Process	1	211	156	Water: 750 m NG: 467 m^3 GHG emission reduction: 1 ton
Utility	1	95	25	Water: 110 m^3 NG: 68 m^3 GHG emission reduction:0.1 ton
Total	2	306	181	Water: 860 m^3 NG: 535 m^3 GHG emission reduction: 1.1 ton

**1 USD = BDT. 78.00*

Implementing the improvements leads to the following changes in the dominant KPI's:

Parameter (based on 2014 data)	Unit	Current KPI	Future KPI	% of reduction
Water consumption	m^3/year	9140	8280	10

15, New Bailey Road, Building # 2, (2nd Floor), Dhaka-1000
Mobile: +8801670 999900, Tel: +880-2-8321823, Fax +880-2- 8321823
E-mail:info@bdtechnology.net, bdtechnology@gmail.com
Web: www.bdtechnology.net

The details of the option generated in different areas are given in the table below:

SL_N	Measure	Estimated investment USD	Economic benefits USD/year	Environmental benefits/year	Payback time, month
Process Area					
1	Reducing water consumption by installing water trigger nozzles for screen cleaning.	211	156	Water: 750 m^3 NG: 467 m^3 GHG emission reduction: 1 ton	16
Utility Area					
1	Reduce water consumption by installing water guard/tap-mouth in water tap.	95	25	Water: 110 m^3 NG: 68 m^3 GHG emission reduction:0.1 ton	45

WASH					
1	Review the need for additional drinking water point at process	-	-	Ensure better working environment	-
2	Ensure cleanliness and hand wash materials at wash room and toilet	-	-	Ensure healthy and hygienic environment	-
3	Raise awareness among workforces on hygiene practices	-	-	Ensure healthy and hygienic environment	-

15, New Bailey Road, Building # 2, (2nd Floor), Dhaka-1000
Mobile: +8801670 999900, Tel: +880-2-8321823, Fax +880-2- 8321823
E-mail:info@bdtechnology.net, bdtechnology@gmail.com
Web: www.bdtechnology.net

List of Acronyms and Abbreviations

BDT	Bangladeshi Taka
BV	Bureau Veritas
DOE	Department Of Environment
ETP	Effluent Treatment Plant
GHG	Green House Gas
GSM	Gram per Square Meter
ICDDR, B	International Centre for Diarrheal Disease Research, Bangladesh
KPI	Key Performance Indicator
MSDS	Material Safety Data Sheet
NG	Natural Gas
OHS	Occupational Health & Safety
pH	Power of Hydrogen
PPE	Personal Protective Equipment
TDS	Total Dissolved Solids
TSS	Total Suspended Solids
WASH	Water sanitation & hygiene
WAA	Water Audit Assessment

15, New Bailey Road, Building # 2, (2nd Floor), Dhaka-1000
Mobile: +8801670 999900, Tel: +880-2-8321823, Fax +880-2- 8321823
E-mail:info@bdtechnology.net, bdtechnology@gmail.com
Web: www.bdtechnology.net

Table of Content

15, New Bailey Road, Building # 2, (2nd Floor), Dhaka-1000
Mobile: +8801670 999900, Tel: +880-2-8321823, Fax +880-2- 8321823
E-mail:info@bdtechnology.net, bdtechnology@gmail.com
Web: www.bdtechnology.net

1. Introduction

1.1 Company Overview

Company name: Knit-Concern Printing Unit.

Address:

Purbapara, Enayetnagar, Siddirgonj, Narayangong, Bangladesh

Year of establishment: 2012

Company Structure: This unit is one of the key establishments of the group in textile sector. There is Packaging section in the same premises.

Production overview: Knit-Concern Printing Unit is a knit fabric printing mill having installed production capacity 150000 pcs/day or 2.5 ton/day. Presently, the average production is around 120000 pcs/day or 2.2 ton/day. The raw material of this mill is knitted cutting fabric. The average GSM of finished fabric is around 160 to 170 and average width of finished fabric is around 60 to 70 inches. The factory is producing printing fabric.

Major Clients: H&M, MONKI, COS, JULES, BIZZBEE, OKAIDI, OBAIBI, CAMALEU LADIES, CARREFOUR, BETTY BARCLAY, WE(Woman), K&L, ESPRIT, CELIO, NEXT.

Expansion plan: No specific plans considering expanding the printing processing.

Number of employees: Presently, total 500 workers are engaged in the factory of which 320 are female and 180 are male.

Existing pollution control facilities: Factory operates one ETP (chemical) with a capacity of 1 m^3/hr. Routine monitoring is in practice to maintain acceptable limit of discharged wastewater. ETP sludge is sold to brick fields and other solid wastes are sold to authorized customer at a regular frequency. Presently, there is no control system for air emission.

15, New Bailey Road, Building # 2, (2nd Floor), Dhaka-1000
Mobile: +8801670 999900, Tel: +880-2-8321823, Fax +880-2- 8321823
E-mail:info@bdtechnology.net, bdtechnology@gmail.com
Web: www.bdtechnology.net

1.2 Water Audit Team

Factory WA Team:

In order to carry out the WA assessment a WA team was formulated at the factory level. Following are the members of the WA team.

Name	Designation	Designated role in WAA
Zahirul Islam Ani	Environmental Management System Manager	Monitoring

Strengthening the awareness on WA concept and benefits among the core team members. Sharing a standard paper prior to and during assessment can be helpful to make them involved and committed. WA core team can further disseminate the basic concepts and benefits across the factory staff.

WA Assessor Team:

The WA assessment was carried out by the following team.

Name	Designation	Designated role in WAA
Md. Kamruzzaman	General Maneger	Water Audit
Umer Faruq Herok	Environmentalist	Water Audit

1.3 Objective and scope of the Water Audit Assessment

The objective of the Water Audit Assessment is to identify the environmental impacts of the printing mill and develop opportunities for improvement in the water use. The scope of the WAA covers the printing processing areas. The potential improvements will be assessed and those considered economically feasible proposed to the mills management.

15, New Bailey Road, Building # 2, (2nd Floor), Dhaka-1000
Mobile: +8801670 999900, Tel: +880-2-8321823, Fax +880-2- 8321823
E-mail:info@bdtechnology.net, bdtechnology@gmail.com
Web: www.bdtechnology.net

2 Production Overview

2.1 Description of production processes

Knit-Concern Printing Unit is a knit fabric printing mill having installed production capacity of 1, 50,000 pcs/day or 2.5 ton/day. Presently, the average production is around 1, 20,000 pcs/day or 2.2 ton/day. The raw material of this mill is knitted cutting fabric. The average GSM of finished fabric is around 160 to 170 and average width of finished fabric is around 60 to 70 inches. The factory is producing printing fabric.

2.2 Main Inputs

Water:

The source of water for the factory is groundwater. Submersible pumps are used to abstract water.

Source	Average consumption/year	Cost/year (2016), USD
Groundwater	9140	487

**1 USD = BDT. 78.00*

*** Water cost: 4.16 BDT./m^3*

2.3 Waste Streams

Waste Stream	Average generation	Remarks
Wastewater	6 m^3/day	Wastewater is treated in ETP and then discharged

2.4 Water Footprint

Factory uses ground water to meet all its processing needs. Wastewaters generated are being discharged to river after treatment in the ETP.

Flow meters are connected at deep pump, all process inlet, inlet in domestic purpose use and ETP outlet points.

Water footprint values have been calculated based on available data. Following table shows the values of various Blue and Grey water footprint of the factory.

15, New Bailey Road, Building # 2, (2nd Floor), Dhaka-1000
Mobile: +8801670 999900, Tel: +880-2-8321823, Fax +880-2- 8321823
E-mail:info@bdtechnology.net, bdtechnology@gmail.com
Web: www.bdtechnology.net

Blue water footprint:

Parameter	m^3/day	m^3/kg of product
Blue water footprint for the factory	29	0.0132
Blue water footprint for the fabric printing	6	.002727

Post data source: Factory flow meter

2.5 Water Sanitation & Hygiene (WASH)

Overall drinking water supply system:

Observations:

- Source of the drinking water (includes source and type): Ground water.
- Water treatment of drinking water (filtration, cooling): No cooling system is available.
- Water quality: Drinking water is tested quarterly and report is available and within acceptable limits. ICDDR'B is the testing authority.
- Responsibility for proper functioning: There is a responsible person available on the factory for maintaining the drinking water facilities.

Recommendations:

- Management should review the need for additional drinking water points at printing process.
- Management should maintain the drinking water quality in agreement with ECA1995 and ECR1997.

Existing sanitation facilities:

Observations:

- Showers and washing rooms: Not available.
- Availability of soap in toilets: Not available during inspection.
- Responsibility for sanitation**:** For maintaining the sanitation facilities a responsible person is available in the factory.

Recommendations:

- Factory management should ensure availability of hand wash materials at toilets.
- Factory management should arrange awareness session on hygiene practice among workforces.
-

15, New Bailey Road, Building # 2, (2nd Floor), Dhaka-1000
Mobile: +8801670 999900, Tel: +880-2-8321823, Fax +880-2- 8321823
E-mail:info@bdtechnology.net, bdtechnology@gmail.com
Web: www.bdtechnology.net

3 Assessment

3.1 Process Details

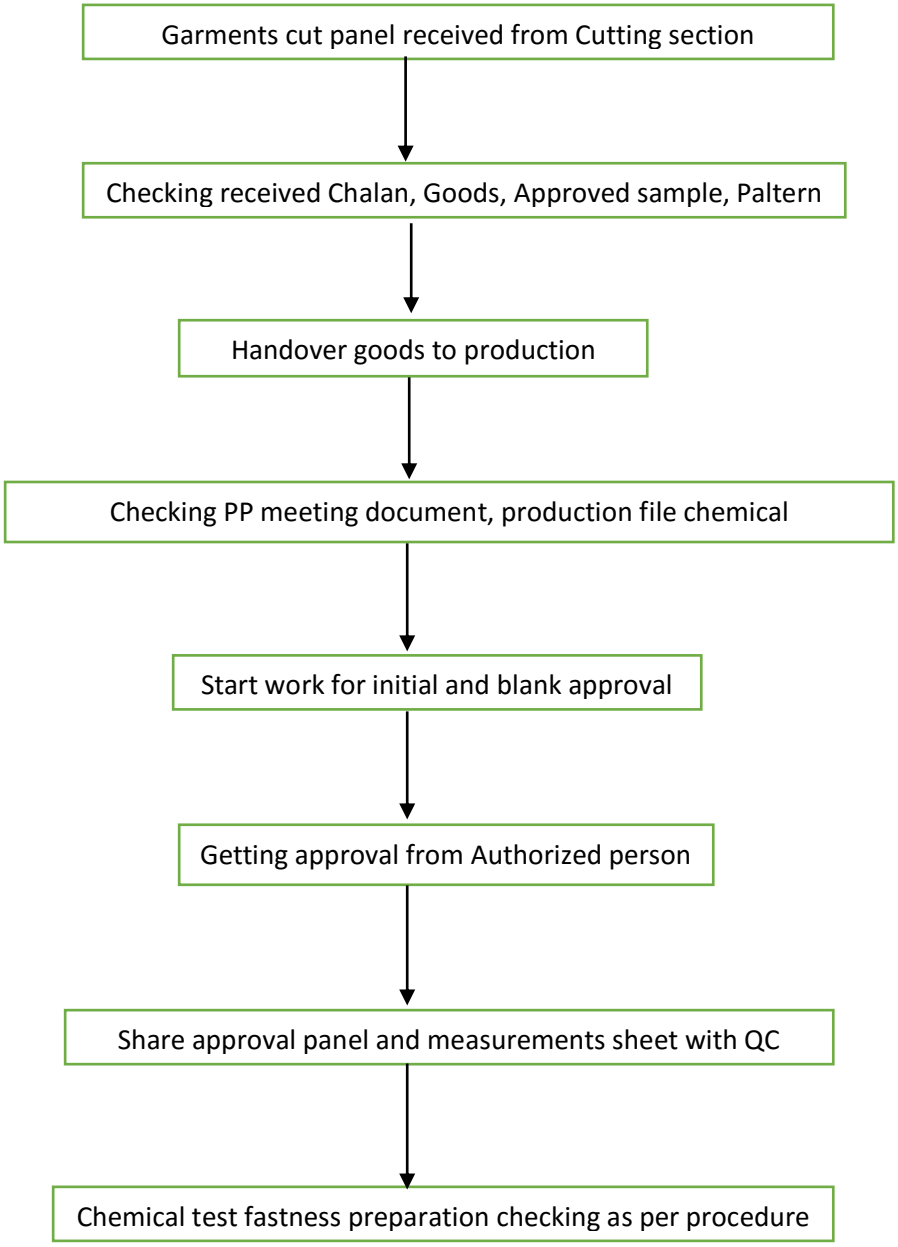
3.1.1 Process Flow Diagram

For printing process, the factory is using automatic printing machine, manual printing process, curing machine and others some machine use for printing process.

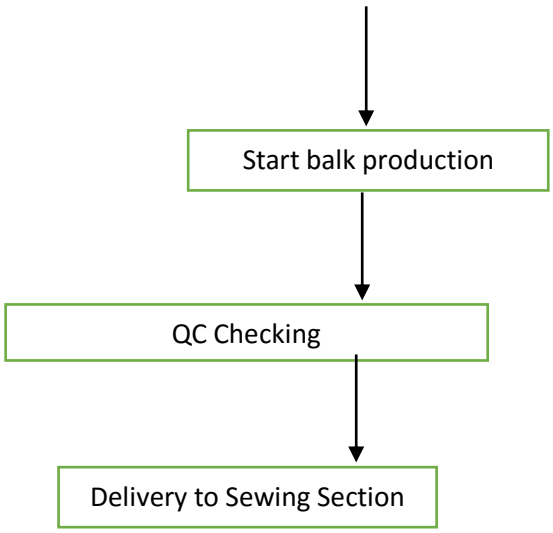
The available production process descriptions are given below:

Major process flow diagrams:

The common process flow diagrams for printing of different shades are shown in the following pages.



15, New Bailey Road, Building # 2, (2nd Floor), Dhaka-1000
Mobile: +8801670 999900, Tel: +880-2-8321823, Fax +880-2- 8321823
E-mail:info@bdtechnology.net, bdtechnology@gmail.com
Web: www.bdtechnology.net



3.2 Water balance

3.2.1 Water balance diagram

A water balance diagram has been established based on flow meter readings, process flow analysis and on-site assessment. Water flow meters are available in the factory. Data is captured by factory people from those meters but no water balance diagram had established in the past. The accuracy of the data is related to flow meter accuracy and water consumption analysis on available process flow diagrams.

15, New Bailey Road, Building # 2, (2nd Floor), Dhaka-1000
Mobile: +8801670 999900, Tel: +880-2-8321823, Fax +880-2- 8321823
E-mail:info@bdtechnology.net, bdtechnology@gmail.com
Web: www.bdtechnology.net

Figure presents the water balance diagram thus evolved.

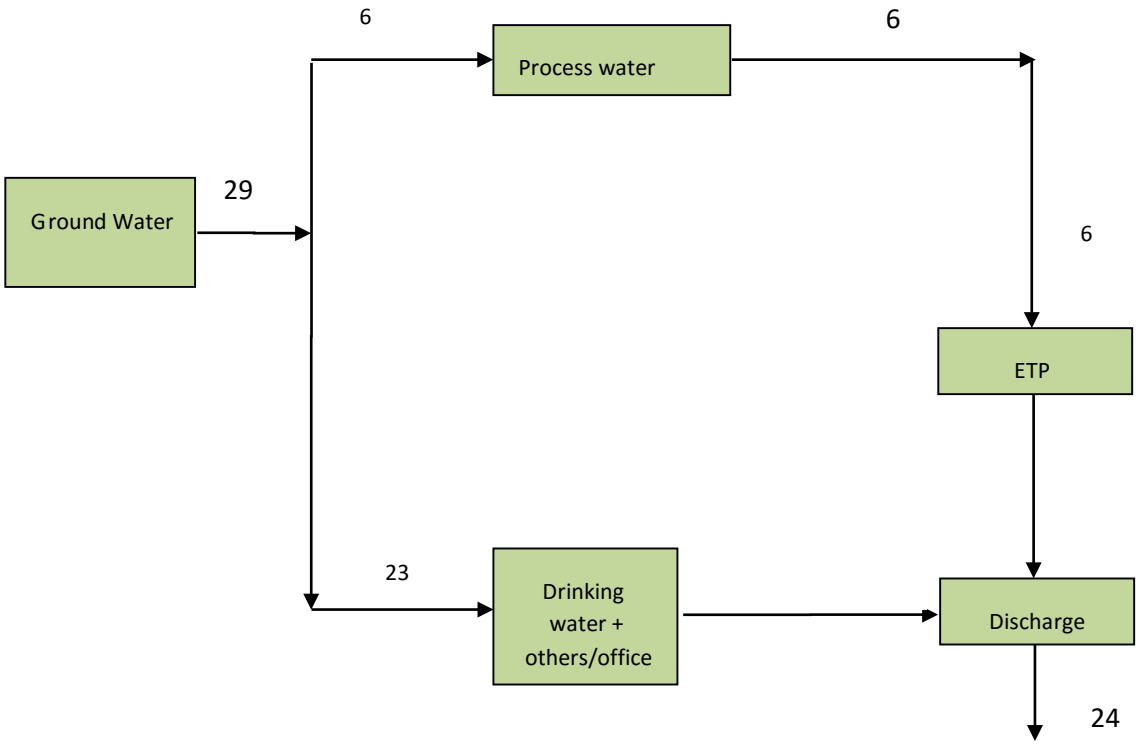


Figure 5: Water balance diagram

As per factory information, all wastewater comes to the ETP which has been highlighted in the water balance diagram.

3.2.2 Water current baseline (KPI):

The water consumption KPI for the wet section has been calculated and presented below.

Product	Average water consumption/unit of product	Average water cost/unit of product, USD
Average	3 litre/kg	0.0097

**1 USD = BDT. 78.00*

*** Water cost: 4.16 BDT./m^3*

15, New Bailey Road, Building # 2, (2nd Floor), Dhaka-1000
Mobile: +8801670 999900, Tel: +880-2-8321823, Fax +880-2- 8321823
E-mail:info@bdtechnology.net, bdtechnology@gmail.com
Web: www.bdtechnology.net

4 Assessment and WA options

4.1 Opportunities in process areas:

Option 1: Reducing water consumption by installing water trigger nozzles for screen cleaning

It has been calculated that approximately 6 m^3 water is consumed per day for Screen cleaning using.

Description of option	Technical feasibility	Environmental feasibility	Economic feasibility
By installing water trigger nozzle instead of open hose pipe, approximately 2.8 m^3/day water can be saved.	Proven technology. Easy to install. No training required.	Water saving: 750 m^3/year NG: 467 m^3 GHG emission reduction: 1 ton	Estimated investment : 211 USD Annual savings (water): 156 USD Payback period is around 16 months

4.2 Opportunities in utility area:

Option 1: Reducing water consumption by installing water guard/tap-mouth in water tap.

It has been calculated that approximately 10 m^3 water is consumed per day for Screen cleaning using.

Description of option	Technical feasibility	Environmental feasibility	Economic feasibility
Reduce water consumption by installing water guard/tap-mouth in water tap.	Proven technology. Easy to install. No training required.	Water saving: 110 m^3/year NG: 68 m^3 GHG emission reduction:0.1 ton	Estimated investment : 95 USD Annual savings (water): 25 USD Payback period is around 45 months

15, New Bailey Road, Building # 2, (2nd Floor), Dhaka-1000
Mobile: +8801670 999900, Tel: +880-2-8321823, Fax +880-2- 8321823
E-mail:info@bdtechnology.net, bdtechnology@gmail.com
Web: www.bdtechnology.net

Option 2: Improving metering system

Currently, factory has water flow metering systems available in deep pump, process inlet, others use, ETP inlet and outlet.

Description of option	Technical feasibility	Environmental feasibility	Economic feasibility
A proper metering system will help to understand the consumption patterns and analysis can be made to introduce corrective measures for any abnormal usage.	Meters available	No impact	No straight forward payback but will help to set benchmarks, ensure proper monitoring to identify unexpected resource usage and need for necessary corrective action immediately.

Measuring consumption will automatically lead to an improved awareness and a strengthened resource management.

Additional potential saving opportunities:

- Installation of high efficiency motors can save energy up to 30% comparing to conventional motors. Factory management can plan for future replacement of existing conventional motors with high efficiency motors (HEMs).

4.3 Summary of options:

SL_N	Measure	Estimated investment USD	Economic benefits USD/year	Environmental benefits/year	Payback time, month
Process Area					
1	Reducing water consumption by installing water trigger nozzles for screen cleaning.	211	156	Water: 750 m^3 NG: 467 m^3 GHG emission reduction: 1 ton	16
Utility Area					
1	Reduce water consumption by installing water guard/tap-mouth in water tap.	95	25	Water: 110 m^3 NG: 68 m^3 GHG emission reduction:0.1 ton	45
Total		**306**	**181**	**-**	**20**

15, New Bailey Road, Building # 2, (2nd Floor), Dhaka-1000
Mobile: +8801670 999900, Tel: +880-2-8321823, Fax +880-2- 8321823
E-mail:info@bdtechnology.net, bdtechnology@gmail.com
Web: www.bdtechnology.net

5 Conclusions

5.1 Summary of assessments

Resource efficiency:

The baseline performances developed has been based on 2016-17 data given by the factory and on-site measurements taken by the WAA team during assessment. Overall, water consumption at printing processes is not so high compared to what can be commonly found in textile industries as reported in various published literatures. Since water consumption KPI for printing process is developed on process flow analysis, further analysis based on authentic data is required to establish exact baseline and move forward for improvements.

Metering System:

Water flow meters are available and the data generated is recorded. However, no consumption efficiency analysis has been done so far by factory management with those data. To optimise the water, implementing an effective measurement system along with data capturing initiative can help to analyse the performance. A performance based action plan can lead to sustainable improvements.

Raising awareness among related workforce can facilitate the expected outcomes.

WASH:

In the WASH areas, review of drinking water points, availability of hand wash materials and raising awareness on hygienic practices among workers can ensure a healthy and hygienic environment. Moreover, the factory is advised to consider ECA 1995 and ECR 1997 for drinking water quality.

ETP:

The factory operates one chemical ETP having a capacity of total 1 m^3/hr. Factory management carries out routine monitoring for few parameters of ETP inlet and outlet water to maintain acceptable limit of discharged wastewater. All parameters are checked from authorized external source at a regular frequency.

15, New Bailey Road, Building # 2, (2nd Floor), Dhaka-1000
Mobile: +8801670 999900, Tel: +880-2-8321823, Fax +880-2- 8321823
E-mail:info@bdtechnology.net, bdtechnology@gmail.com
Web: www.bdtechnology.net

5.2 Summary of options:

Total 2 options have been identified of which 1 is applicable in the printing process section and 1 in the utilities section.

Area	Total number of options	Estimated investment, *USD	Economic benefits, *USD/year	Annual environmental benefits
Process	1	211	156	Water:750m^3 NG: 467 m^3 GHG emission reduction: 1 ton
Utility	1	95	25	Water: 110 m^3 NG: 68 m^3 GHG emission reduction:0.1 ton
Total	2	306	181	Water: 860 m^3 NG: 535 m^3 GHG emission reduction: 1.1 ton

**1 USD: BDT 78.00*

Total amount of savings calculated is 181 USD. The savings are based on the reduction in costs of water, natural gas and GHG emission. The total estimated investment amount calculated is 306 USD, which leads to an estimated payback period for the total number of improvements of around 20 months.

15, New Bailey Road, Building # 2, (2nd Floor), Dhaka-1000
Mobile: +8801670 999900, Tel: +880-2-8321823, Fax +880-2- 8321823
E-mail:info@bdtechnology.net, bdtechnology@gmail.com
Web: www.bdtechnology.net

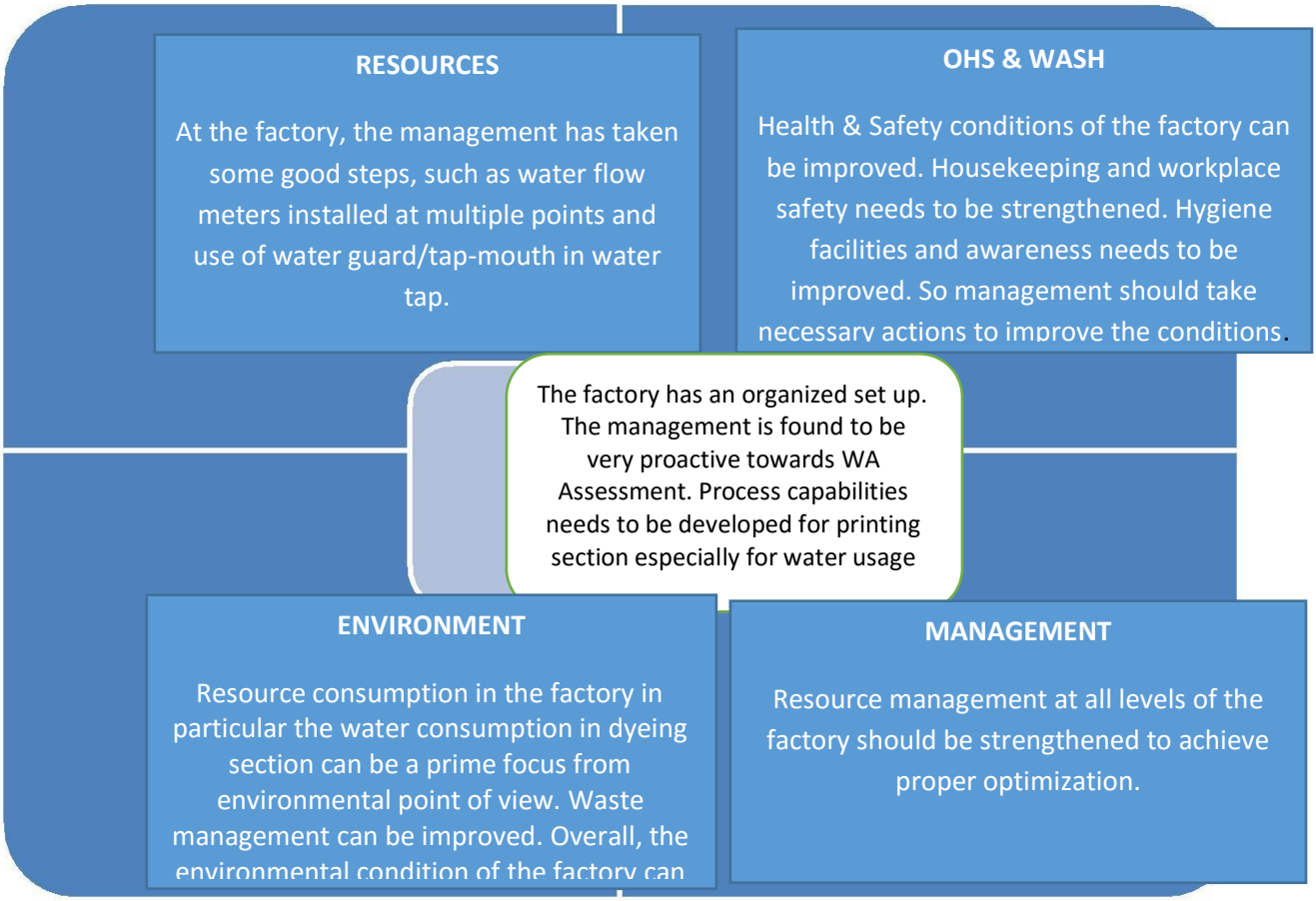
5.3 KPI's:

The current KPI's have been established from 2016-17 data and on-site measurements. The future KPI's have been developed on the reduction in resources when implementing the improvements.

Parameter	Unit	Current KPI	Future KPI	% of reduction
Average water consumption	m^3/year	9140	8280	10
Wastewater	m^3/year	1882	1132	40
Blue water foot print for factory	m^3/day	29	26	10

5.4 Conclusions:

The main objective of the WAA is to assess Water, WASH, Water footprint and the Management System. The chart described below gives a qualitative assessment in the above mentioned major four areas. The general assessment for the industrial set up is given in the center. The factory team and the senior management were found to be very cooperative and they supplied the required data to the best of their abilities.



15, New Bailey Road, Building # 2, (2nd Floor), Dhaka-1000
Mobile: +8801670 999900, Tel: +880-2-8321823, Fax +880-2- 8321823
E-mail:info@bdtechnology.net, bdtechnology@gmail.com
Web: www.bdtechnology.net

At Knit-Concern Printing Unit options have been identified in the process and utilities area which have the potential to save approximately 181 USD per annum with an investment of 306 USD. The resource savings compared to the consumption is shown in the table below.

Resource/impact	Annual savings	Annual consumption/generations
Water in m^3	860	8280 (10% reduction)

When comparing Knit-Concern Printing Unit's water resource consumption indicator for knit fabric printing of 3 l/kg with the available standards published in various literatures, it seems water consumption is much higher and there is a scope to reduce the water consumption further. As the basic WA assessment identifies obvious options and the so-called low hanging fruits a more in-depth inspection of the process might be advisable. Furthermore there are small areas like uses of water hose for general cleaning; hidden leaks, re-dyeing etc. can be good reasons for higher water usage. Strengthening the awareness of workers and management, stricter metering and evaluation of consumption per section and per activity can make the water usage rate even better.

Both the WASH and OHS/EMS activities need some improvement in order to uplift the current status. For WASH this requires reviewing drinking water facility, ensuring hand wash materials at washrooms and toilets and raising awareness on hygiene practices. For OHS/EMS some attention has to be given to improve the storage conditions of chemicals in the stores, addressing poor housekeeping, strengthen the workplace safety and to improve the waste management.

Prepared By:
Umer Faruq Herok
B.Sc. in ESRM (MBSTU)
M.S in Environmental Science (BAU)
Environmentalist

Approved By:
Md. Kamruzzaman
B.Sc. in CSE (UAP)
MBA (London, UK)
Energy Auditor by AEE,USA
General Manager