CRIMSON PUBLISHERS
Wings to the Research

Trends in Textile Engineering & Fashion Technology

ISSN 2578-0271

Short Communication

To Reduce Chemical Consumption in Pretreatment Process of Terry Towel Processing

Kiran Patil, Tushar A Shinde* and Raichurkar PP

Mukesh Patel School of Technology, SVKM'S NMIMS, India

***Corresponding author:** Tushar A Shinde, SVKMS, NMIMS, Centre for Textile Functions, Mukesh Patel School of Technology, Management Shirpur, District Dhule-425405, India

submission: August 01, 2018 **Published:** August 14, 2018

Abstract

This study is aim to standardize the process parameter is desizing, scouring and bleaching and come out with the best practice in chemical consumption in pretreatment of terry towel. The determination of the pretreatment performance because of desizing, scouring and bleaching chemical concentration.

The careful consideration of process parameter in pretreatment helps the wet processing industry to ensure the application of standard concentration of the chemical during processing. The concentration of alkali use in the pretreatment of cotton is represented by many researches.

In this process by varying the chemical concentration, time and temperature, we obtain good result. This particular research on the reduction of the total chemical consumptions, time and temperature. The results were found to promising and comparable to that conventional pretreatment fabric which is performing in terry towel industry.

The aim of this project work is to develop less consumption of chemical pretreatment method which can produce similar desizing efficiency, whiteness index, and absorbency of the fabric. In this study we found reduction of pollution load associated with excessive usage of chemical in standard conventional pretreatment process.

It was found that with the reduction of caustic, stabilizer and Hydrogen Peroxide concentration performance of pretreatment become better. Effect of the above process by reducing chemical consumptions in desizing scouring, bleaching (pretreatment) of terry towel fabric in soft-flow Thies machine which gives good results and better absorbency, bleaching efficiency and whiteness index of bleached fabric which have been studied in this work.

Keywords: Pretreatment; Chemical concentration; Desizing; Scouring; Bleaching; Absorbency; Whiteness-index

Introduction

The textile dyeing sector uses large quantities of chemical companies operating challenges this project to identify the different types of chemical used and the overall quantities involved in each case; check the use of standard chemical doses in pretreatment process and check the RFD (Ready for Dyeing) material parameters i.e. absorbency, whiteness index and desizing efficiency [1]. The benefits of reducing chemical in dyeing process to reduce cost of chemical, time, water, save the energy, ultimately save the cost of pretreatment process [2].

Chemical concentration has demonstrated that substantial cost saving can be made with zero investment by improving operating practice and by changing process in chemical processing [3]. In textile processing the reducing of chemicals doses helps to ETP (Effluent Treatment Plant).

Material and Method

Material

Material used for the experiment was 100% cotton terry towel was procured from textile Park [4], Ruby dyeing II Pvt. Ltd Shirpur, Maharashtra.

A. Machine: Soft flow thies dyeing machine.

Check point of RFD material: 1. Fabric pH should be a neutral. 2. Fabric should be free from residual peroxide & size paste [5].

Method

Check the all parameter during RFD process of terry towel i.e.,

1. Desizing pH
2. Bleaching pH
3. Water pH
4. Hardness of water
5. Hardness of bleaching water
6. Concentration of chemical: After RFD process check parameter i.e

a) pH of terry towel

b) Desizing efficiency

c) Absorbency

Copyright © All rights are reserved by Tushar A Shinde.

Copyright © Daniel Bilbao Peña

d) Whiteness index of terry towel

Experimental Work

Data collection: Lab recipe for desized white before trial

Table 1: Study of pretreatment process before trial for desize white.

Sr. No.	Chemical Name	Concentration of Chemical	Temperature	Time
Step 1	Ready scour	0.2g/l	90 °C	20Min
	Acetic Acid	0.2g/l		
	Emcozyme 40	0 .8g/l		
Step 2	Ready scour	0.3g/l	110 °C	60Min
	Miralizer Cipha	0.6g/l		
	Emsek ET	1.0g/l		
	Caustic Soda Flakes	2.0g/l		
	Hydrogen Peroxide	10g/l		
Step 3	Miralizer Cipha	0.1g/l	110 °C	30Min
	Caustic Soda Flakes	0.5g/l		
	Hydrogen Peroxide	2.5g/l		
Step 4	Hot wash with water		80 °C	10Min
	Hot wash with water		80 °C	6Min
Step 5	Eskay white BHT 115%	0.6g/l	85 °C	30Min
Step 6	Acetic Acid	0.5g/l	60 °C	10Min

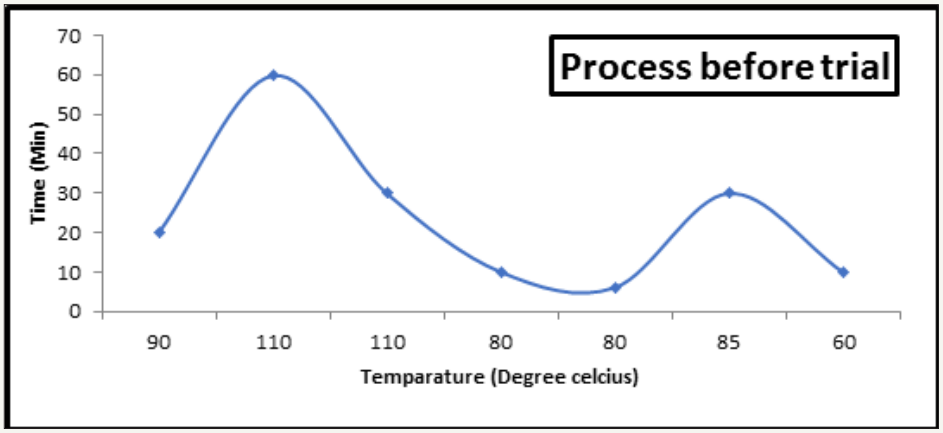


Figure 1: Pretreatment process before trial for desize white.

How to cite this article: Kiran P, Tushar A S, Raichurkar PP. To Reduce Chemical Consumption in Pretreatment Process of Terry Towel Processing . Trends Textile Eng Fashion Technol. 4(1). TTEFT.000579.2018. DOI: 10.31031/TTEFT.2018.04.000579

Copyright © Daniel Bilbao Peña

Data collection: Lab recipe for desized white after trial

Table 2: Study of pretreatment process after trial.

Sr. No.	Chemical Name	Concentration of Chemical	Temperature	Time
Step 1	Ready scour	0.2g/l	90 °C	20Min
	Acetic Acid	0.2g/l		
	Emcozyme 40	0.8g/l		
Step 2	Ready scour	0.3g/l	110 °C	75Min
	Miralizer cipha	0.6g/l		
	Emsek ET	1.0g/l		
	Miralizer cipha	0.1g/l		
	Caustic soda flakes	2.0g/l		
	Hydrogen peroxide	10.0g/l		
Step 3	Hot wash with water		80 °C	10Min
	Hot wash with water		80 °C	6Min
Step 4	Eskay white BHT 115%	0.6%	85 °C	30Min
Step 5	Acetic Acid	0.5g/l	60 °C	10Min

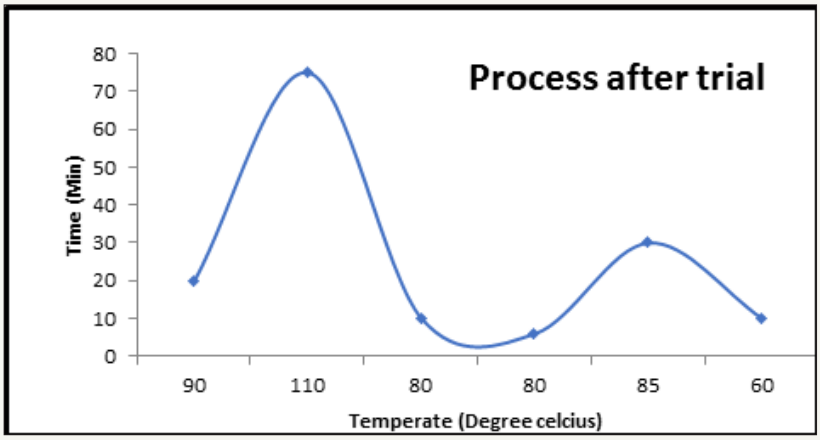


Figure 2: Pretreatment process after trial for desize white.

Data collection: Bulkrecipe for desized white before trial

Shade: White

Table 3: Study of pretreatment process before trial in bulk recipe.

Sr. No.	Check Points	Lot No. 9236-4	Lot No. 9266-1, 2, 3	Lot No. 9242-1, 2	Lot No. 9262-2, 3
1	Water pH	7.5	7.5	7.5	7.5
2	Hardness of water	70	70	70	70
3	Desizing pH	5.5	5.5	5.5	5.5
4	1st Bleaching pH	11	11	11	11
5	2nd Bleaching pH	11	11	11	11
6	Bleaching Hardness	70	70	70	70
7	OBA pH	9.5	9.5	9.5	9.5
8	Neutralization pH	6.5	6.5	6.5	6.5

How to cite this article: Kiran P, Tushar A S, Raichurkar PP. To Reduce Chemical Consumption in Pretreatment Process of Terry Towel Processing . Trends Textile Eng Fashion Technol. 4(1). TTEFT.000579.2018. DOI: 10.31031/TTEFT.2018.04.000579

Copyright © Daniel Bilbao Peña

9	Whiteness index of 1st bleached sample	74.97	77.43	3.25	73.59
10	Whiteness index of 2nd bleached sample	74.17	78.31	73.17	72.49
11	Absorbency %	72	72	70	50
12	GSM of towel	595	700	613	546
13	Absorbency of final sample	152.14	148.42	147.84	142.96

Data collection: Bulk recipe for desized white after trial

Shade: White

Table 4: Study of pretreatment process after trial in bulk recipe.

Sr. No.	Check Points	Lot No. 9366	Lot No. 9369	Lot No. 9373-1 & 9374-3, 4	Lot No. 9427-2, 3
1	Water pH	7.5	7.5	7.5	7.5
2	Hardness of water	70	70	7o	7o
3	Desizing pH	5.5	5.5	5.5	5.5
4	Bleaching pH	11	11	11	11
5	Bleaching Hardness	70	70	70	70
6	OBA pH	9.5	9.5	9.5	9.5
7	Neutralization pH	6.5	6.5	6.5	6.5
8	Whiteness index of bleached sample	77.83	79.55	77.54	79.11
9	Absorbency %	64	76	80	58
10	GSM of towel	546	566	570	493

Data collection-2

Study of RFD process in lab (2.5gpl caustic):

Table 5:

Sr. No.	Chemical Name	Concentration of Chemical	Temperature	Time
Step 1	Ready scour	0.2g/l	90 °C	20Min
	Acetic Acid	0.2g/l		
	Emcozyme 40	0.8g/l		
Step 2	Ready scour	0.3g/l	110 °C	3Min
	Miralizer Cipha	0.6g/l		
	Emsek ET	1.0g/l		
	Caustic Soda Flakes	2.5g/l		
	Hydrogen Peroxide	2.5g/l		
Step 4	Acetic Acid	1.2g/l	55 °C	6Min
Step 5	Emcozyme Quencher M	0.4g/l	55 °C	10Min
Step 6	Miragen MER	0.5g/l	60 °C	5Min

A. RFD Process in lab (1.5gpl caustic):

Table 6:

Sr. No.	Chemical Name	Concentration of Chemical	Temperature	Time
Step 1	Ready scour	0.2g/l	90 °C	20Min
	Acetic Acid	0.2g/l		
	Emcozyme 40	0.8g/l		

How to cite this article: Kiran P, Tushar A S, Raichurkar PP. To Reduce Chemical Consumption in Pretreatment Process of Terry Towel Processing . Trends Textile Eng Fashion Technol. 4(1). TTEFT.000579.2018. DOI: 10.31031/TTEFT.2018.04.000579

Copyright © Daniel Bilbao Peña

Step 2	Ready scour	0.3g/l	110 °C	30Min
	MiralizerCipha	0.6g/l		
	Emsek ET	1.0g/l		
	Caustic Soda Flakes	1.5g/l		
	Hydrogen Peroxide	2.5g/l		
Step 4	Acetic Acid	1.2g/l	55 °C	6Min
Step 5	Emcozyme Quencher M	0.4g/l	55 °C	10Min
Step 6	Miragen MER	0.5g/l	60 °C	5Min

B. Before result in lab:

Table 7:

Sr. No.	2.5gpl Result in Caustic			1.5gpl Result in Caustic	
	Check point	1St trail	1st trail	2nd trail	2nd trail
1	Water pH	7.5	7.5	7.5	7.5
2	Hardness of water	70	70	70	70
3	Desizing pH	5.5	5.5	5.5	5.5
4	Bleaching pH	11	11	11	11
5	Peroxide killer	-	-	-	-
6	Netralization pH	6.5	6.5	6.5	6.5
7	Levelling pH	6.5	6.5	6.5	6.5
8	Absorbency %	56	70	58	69
9	Whiteness	70.56	62.87	62.60	62.87
10	GSM	550	546	552	545

Study of RFD process before trial in bulk processs:

Table 8:

Sr. No.	Chemical Name	Concentration of Chemical	Temperature	Time
Step 1	Ready scour	0.2g/l	90 °C	20Min
	Acetic Acid	0.2g/l		
	Emcozyme 40	0.8g/l		
Step 2	Ready scour	0.3g/l	110 °C	30Min
	Miralizer cipha	0.6g/l		
	Emsek ET	1.0g/l		
	Caustic Soda Flakes	2.5g/l		
	Hydrogen Peroxide	2.5g/l		
Step 4	Acetic Acid	1.2g/l	55 °C	6Min
Step 5	Emcozyme Quencher M	0.4g/l	55 °C	10Min
Step 6	Miragen MER	0.5g/l	60 °C	5Min

A. Bulk RFD process before trial data:

How to cite this article: Kiran P, Tushar A S, Raichurkar PP. To Reduce Chemical Consumption in Pretreatment Process of Terry Towel Processing . Trends Textile Eng Fashion Technol. 4(1). TTEFT.000579.2018. DOI: 10.31031/TTEFT.2018.04.000579

Copyright © Daniel Bilbao Peña

Table 9:

Shade		Dark Blue	Stone	Light Blue	Purple
Lot No.		9179-1	9316-1,2	9357-1,2	9583-1,2
Sr. No.	**Check points**				
1	Water pH	7.5	7.5	7.5	7.5
2	Hardness of water	70	70	70	70
3	Desizing pH	5.5	5.5	5.5	5.5
4	Bleaching pH	11	11	11	11
5	Neutralization pH	6.5	6.5	6.5	6.5
6	Peroxide Killer	0mg/Lit	0mg/Lit	0mg/Lit	0mg/Lit
7	Levelling pH	6.5	6.5	6.5	6.5
8	Absorbency %	50	70	48	50
9	Whiteness	59.89	62.13	51.82	62.15
10	GSM	406	558	560	553
11	Final sample Absorbency %	66	82	82	83

B. Study of RFD process after trial:

Table 10:

Sr. No.	Chemical Name	Concentration of Chemical	Temperature	Time
Step 1	Ready scour	0.2g/l	90 °C	20Min
	Acetic Acid	0.2g/l		
	Emcozyme 40	0.8g/l		
Step 2	Ready scour	0.3g/l	110 °C	30Min
	Miralizer cipha	0.6g/l		
	Emsek ET	1.0g/l		
	Caustic Soda Flakes	2.0g/l		
	Hydrogen Peroxide	2.5g/l		
Step 4	Acetic Acid	1.2g/l	55 °C	6Min
Step 5	Emcozyme Quencher M	0.4g/l	55 °C	10Min
Step 6	Miragen MER	0.5g/l	60 °C	5Min

Part 1: Trail with 2.0 GPL caustic in RFD process:

How to cite this article: Kiran P, Tushar A S, Raichurkar PP. To Reduce Chemical Consumption in Pretreatment Process of Terry Towel Processing . Trends Textile Eng Fashion Technol. 4(1). TTEFT.000579.2018. DOI: 10.31031/TTEFT.2018.04.000579

Copyright © Daniel Bilbao Peña

Table 11:

Shade		Navy
Lot No.		9305-1
Sr. No.	**Check points**	
1	Water pH	7.5
2	Hardness of water	125
3	Desizing pH	5.5
4	Bleaching pH	11
5	Neutralization pH	6.5
6	Peroxide Killer	0mg/Lit
7	Levelling pH	6.5
8	Absorbency %	78
9	Whiteness	58.64
10	GSM	429
11	Final sample Absorbency %	58

A. After trail results: 2 GPL Caustic (Bulk Trial):

Table 12:

Sr. No.	Chemical Name	Concentration of Chemical	Temperature	Time
Step 1	Ready scour	0.2g/l	90 °C	20Min
	Acetic Acid	0.2g/l		
	Emcozyme 40	0.g/l		
Step 2	Ready scour	0.3 g/l	110 °C	30 Min
	Miralizer cipha	0.6g/l		
	Emsek ET	1.0g/l		
	Caustic Soda Flakes	2.5g/l		
	Hydrogen Peroxide	2.5g/l		
Step 4	Acetic Acid	1.2g/l	55 °C	6Min
Step 5	Emcozyme Quencher M	0.4g/l	55 °C	10Min
Step 6	Miragen MER	0.5g/l	60 °C	5Min

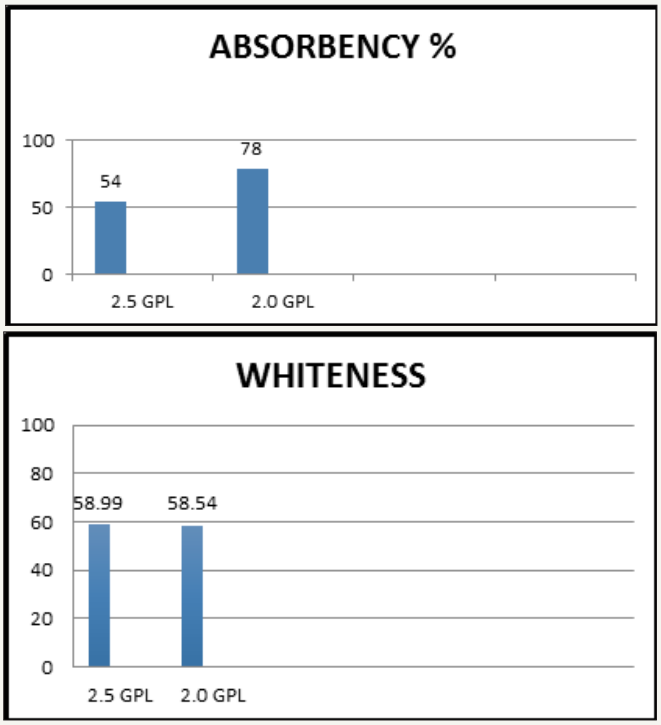


Figure 3:

How to cite this article: Kiran P, Tushar A S, Raichurkar PP. To Reduce Chemical Consumption in Pretreatment Process of Terry Towel Processing . Trends Textile Eng Fashion Technol. 4(1). TTEFT.000579.2018. DOI: 10.31031/TTEFT.2018.04.000579

Copyright © Daniel Bilbao Peña

Part 2: Trail with 2.5 GPL caustic in RFD process:

Table 13:

Sr. No.	Chemical Name	Concentration of Chemical	Temperature	Time
Step 1	Ready scour	0.2g/l	90 °C	20Min
	Acetic Acid	0.2g/l		
	Emcozyme 40	0.8g/l		
Step 2	Ready scour	0.3g/l	110 °C	30Min
	Miralizer cipha	0.6g/l		
	Emsek ET	1.0g/l		
	Caustic Soda Flakes	2.5g/l		
	Hydrogen Peroxide	2.5g/l		
Step 4	Acetic Acid	1.2g/l	55 °C	6Min
Step 5	Emcozyme Quencher M	0.4g/l	55 °C	10Min
Step 6	Miragen MER	0.5g/l	60 °C	5Min

A. Before trail results:

Table 14:

Shade		Grey
Lot No.		9644-1,2
Sr. No.	**Check points**	
1	Water pH	7.5
s2	Hardness of water	70
3	Desizing pH	5.5
4	Bleaching pH	11
5	Neutralization pH	6.5
6	Peroxide Killer	Nil
7	Levelling pH	6.5
8	Absorbency %	50
9	Whiteness	61.29
10	GSM	410
11	Final sample Absorbency %	40

B. After trail results:

Table 15:

Shade		Brunt Orange
Lot No.		9645-3
Sr. No.	**Check points**	
1	Water pH	7.5
2	Hardness of water	70
3	Desizing pH	5.5
4	Bleaching pH	11
5	Neutralization pH	6.5
6	Peroxide Killer	Nil
7	Levelling pH	6.5
8	Absorbency %	50
9	Whiteness	67.02
s10	GSM	408
11	Final sample Absorbency %	40

How to cite this article: Kiran P, Tushar A S, Raichurkar PP. To Reduce Chemical Consumption in Pretreatment Process of Terry Towel Processing . Trends Textile Eng Fashion Technol. 4(1). TTEFT.000579.2018. DOI: 10.31031/TTEFT.2018.04.000579

Copyright © Daniel Bilbao Peña

Results and Discussion

Graphical representation

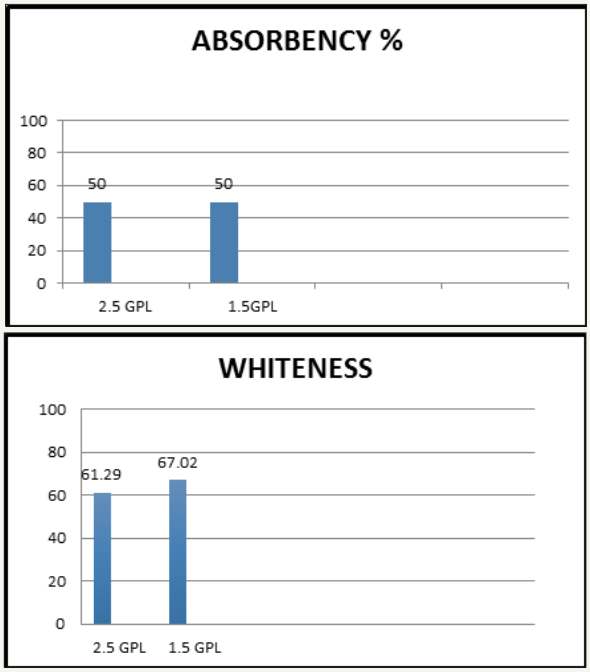


Figure 4:

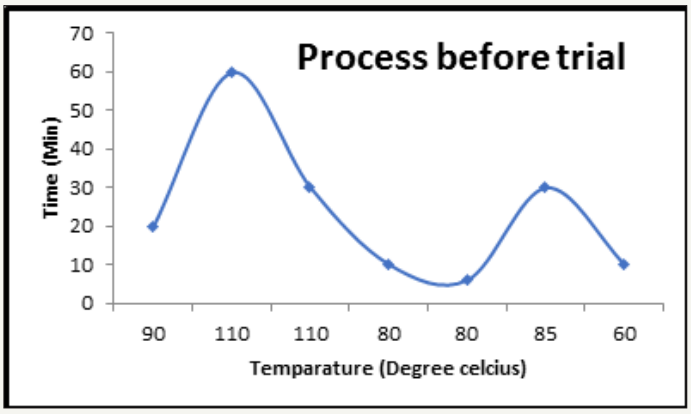


Figure 5: Process for white before trail.

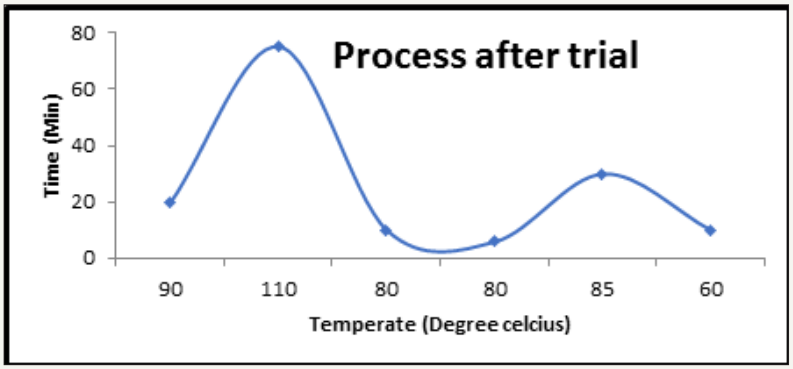


Figure 6: Process for white after trail.

How to cite this article: Kiran P, Tushar A S, Raichurkar PP. To Reduce Chemical Consumption in Pretreatment Process of Terry Towel Processing . Trends Textile Eng Fashion Technol. 4(1). TTEFT.000579.2018. DOI: 10.31031/TTEFT.2018.04.000579

Copyright © Daniel Bilbao Peña

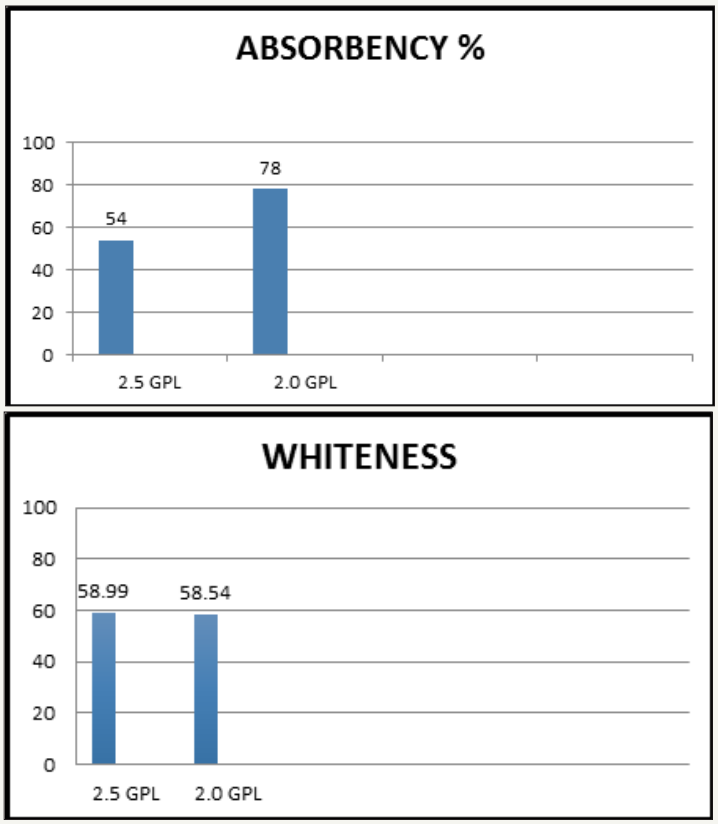


Figure 7: Bulk RFD process before trial.

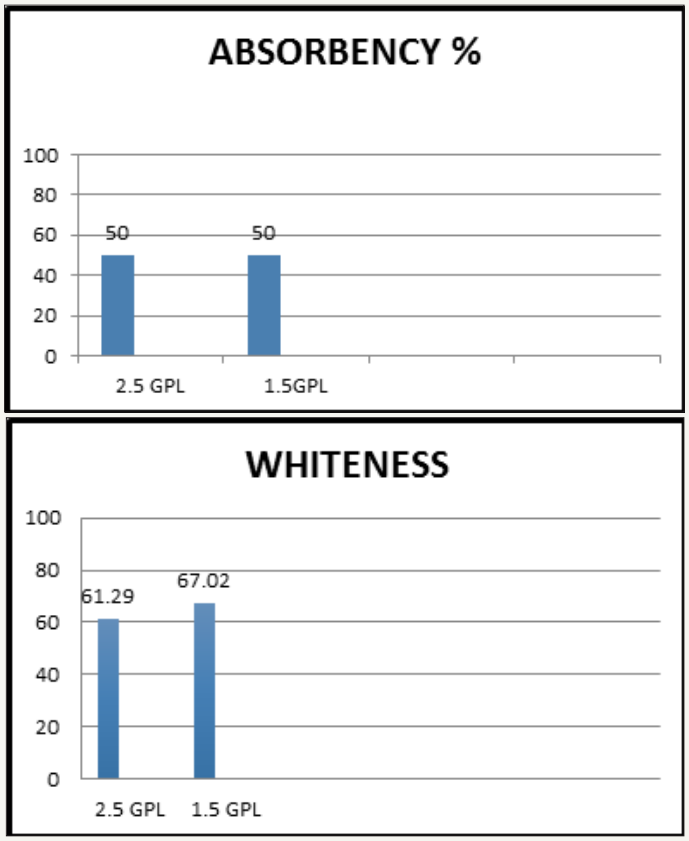


Figure 8: Bulk RFD process after trail.

How to cite this article: Kiran P, Tushar A S, Raichurkar PP. To Reduce Chemical Consumption in Pretreatment Process of Terry Towel Processing . Trends Textile Eng Fashion Technol. 4(1). TTEFT.000579.2018. DOI: 10.31031/TTEFT.2018.04.000579

Discussion

In this project we have try to reduce the chemical consumption in pretreatment of terry towel for this work we first study standard dosages of each chemical used in pretreatment and dyeing of terry towel [6]. After this for month we study the result of these pH and dosages in pretreatment of terry towel and check parameter like absorbency, whiteness, pH desizing efficiency [7-10]. The discusses this with our mentor and other shift officer then with their help we reduce some quantity of chemical from standard dosges from of caustic and take trial in lab and compair it' result against result of standard dosages of caustic and then again under their guidance take trail in bulk production of terry towel by reducing the standard dosges of chemical used in pretreatment and with constant pH, time and temperature and compare result this dosages against standard dosage [11]. In other hand we also study the process of wnite shade in bulk in which bleaching process is carried out two time at 110 °C for 90min and 110 °C for 75min. We reduce one process of them.

Conclusion

In this study, from our experimental result we concluded that desizing efficiency, whiteness index, and absorbency of terry towel is good. The result which is observed and analyze is giving similar data as work which is performed in industry [12]. This study is perform with the use of 2.5, 2 and 1.5g/l NaOH in pretreatment process and compared with 2.5g/l standard concentration of NaOH which is a conventional process. From our experimental result we can implement the use of 2g/l and 1.5g/l caustic in pretreatment process of terry towel instead of standard dosage i.e., 2.5g/l. This is the following points which are obtained as a result after above studies during project work:

1. This process minimizes the process of two-time bleaching process for white shade by changing the time of bleaching process at 110 °C for 75min.

2. Reduction in the chemical consumption i.e NaOH, Hydrogen peroxide and Peroxide Stabilizer in desizing, scouring, and bleaching process of fabric is obtained [13,14].

3. Saving of time, water, temperature, and electricity due to less time-consuming process.

4. Reduces the ETP load by using less concentration of chemical, and due to less NaOH concentration the effluent water become less alkaline and as a result the less amount of acid is using to neutralize effluent water.

5. Reduce the cost of pretreatment process of terry towel due to less chemical usage.

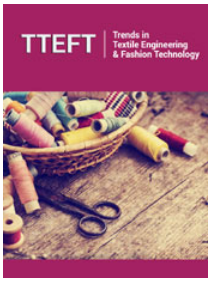
Thus, by above points we can say that this research work is giving good approach of using optimized quantity of chemical and auxiliaries in pretreatment process of cotton fabric.

References

1. Rathi AKA, Bhanujan KB (2004) Cleaner technology development- some practical steps for developing countries. Journal of Environmental Science & Engineering 46(4): 257.
2. Chi IT, Yi ling Y, Ting Chien C, Chi Jen C (2011) The optimal operational design for a three-effect vacuum evaporator and an energy performance assessment. International Journal of Energy Science 1(2): 119.
3. George C, Cushnie (2009) Pollution prevention and control technologies for plating operations. CIA Resources Inc., USA, p. 4.
4. Muhammad Ayaz Shaikh (2009) Environmental issues related with textile sector. Pakistan Trade Journal, Pakistan, p. 36.
5. Report of World Textile Chemicals Industry (2008) Industry study with forecasts for 2012 & 2017. pp. 3-4.
6. (1995) Standard methods for the examination of water and wastewater. (19th edn), Published Jointly by American Public Health Association, American Water Works Association and Water Environment Federation, Washington DC, USA, pp. 1-24.
7. Textile Exchange Online (2009) Recent market trends in the textile chemical industry. pp. 1-2.
8. Wastewater Sampling (2013) SESD operating procedure No. SESDPRO-306-R3, USEPA, USA. pp. 14
9. (2009) Water & wastewater-methods of sampling and analysis, IS-3025-1989 Reaffirmed 2008: HPPWD schedule of rates.
10. (2011) Water and wastewater analysis-A guide manual by central pollution control board.
11. Shenai VA (1991) Technology of bleaching and mercerizing. Sevak Publications (2nd edn.), New Delhi, India.
12. Shore J (2002) Colourant & auxiliaries. Woodhead Publishing Limited, Hampshire, England, 2: 602-607.
13. Savita P, Tushar AS, Madhuri K, Sujit G, Raichurkar PP. International Dyer & Textile Finisher 4(4): 42-45.
14. Shahrukh D, Tushar AS, Raichurkar PP (2018) Colorage 5: 35-42.

Creative Commons Attribution 4.0 International License

For possible submissions Click Here Submit Article



Trends in Textile Engineering & Fashion Technology

Benefits of Publishing with us

- High-level peer review and editorial services
- Freely accessible online immediately upon publication
- Authors retain the copyright to their work
- Licensing it under a Creative Commons license
- Visibility through different online platforms