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ALTERNATIVE AESTHETIC DIVERSIFICATION OF CLOTHES USING PRINTING

ADASCALIȚA Lucia[1], CAZAC Viorica[2]

[1] *Technical University of Moldova, Republic of Moldova, Faculty of Light Industry,* Academician Sergiu Rădăuțan 4 *st., Chisinău city, Republic of Moldova, E-Mail: lutzana@mail.ru*

[2] *Technical University of Moldova, Republic of Moldova, Faculty of Light Industry,* Academician Sergiu Rădăuțan 4 *st., Chisinău city, Republic of Moldova, E-Mail: vioricascobioala@gmail.com*

Corresponding author: Cazac, Viorica, E-mail: vioricascobioala@gmail.com

Abstract: *The fast pace evolves surrounding world reflects on achievement technologies and decorating clothes. The most common, by far, the technique of personalization and printing of textiles and clothes is screen printing technology. Nevertheless, screen printing method limits the printing area and the number of printed colors.*
Screen printing technology is a traditional method to obtain surface images of textiles and since it involves a lengthy process of transition from one model to another great time to adjust equipment it is necessary modernization. Modernization implies the gradual replacement of screen printing technology with digital printing. Digital printing technology is directly applicable on computer to textile raw or cut the selected image using only a special printer using special inks. This new technique provides designers almost unlimited creative freedom and an advantage for all industrial and commercial process in the production system.
The purpose of this study aims to analyze the possibilities of using technological alternatives clothes printing, namely digital printing technologies directly or indirectly.
There were samples subjected to laboratory tests for textile printing by the traditional method – screen printing, and three samples of textile printed by a digital printing method in order to identify different characteristics of resistance to dry friction and drapery prints, vapor permeability zone print, hydrophilicity.
Printing patterns on textiles, which were not feasible in the past – no color limits are now available to everyone through digital printing technologies. It is a superior alternative to screen printing, denoting several strong elements: quickness, effectiveness, economic constraints related to complex manufacturing process and the minimum number of copies, myriad of colors, resistance to washing and ironing.

Key words: *inks, textiles, digital printing directly, digital printing indirectly, technologies.*

1. INTRODUCTION

Prints are one of the elements in vogue fashion trends in clothing products. It has also stimulated interest in the development and modernization of technologies of printing on textiles and knits. The most commonly used method of printing on textiles and knits up to this point has been screen printing. This includes the application of an ink layer by a screen using attached to the frame and a scraper, in order to obtain the desired image on the surface of the fabric. This technology involves a lengthy process of transition from one model to another application time and high technical configuration of the means of production. The development of digital technologies has enabled the expansion of printing on textiles and knits as media. Digital technology has seen a rapid spread since it includes several methods of achieving that exclude many technological steps such printing process is reduced only to the creation of original - layout electronic file and make prints itself.

The purpose of this study aims to analyze the possibilities of using technological alternatives textile printing and digital printing technologies namely direct and indirect with subsequent analysis of the advantages offered by them.

2. GENERAL CONSIDERATIONS ON DIGITAL TEXTILE PRINTING

Field of the digital textile printing (figure 1a, b, 2) can be sized large segment:

1. Printing on polyester textiles;
2. Printing on textiles of natural fibers and synthetic fibers other than polyester, such as:
   - natural textiles - 100% cotton, bleached and / or mercerized;
   - natural cotton or viscose content;
   - 100% natural textiles bleached
   - 100% silk;
   - containing silk cotton, wool and cashmere;
   - natural wool (only thin fabric);
   - viscose (there are technological limitations).

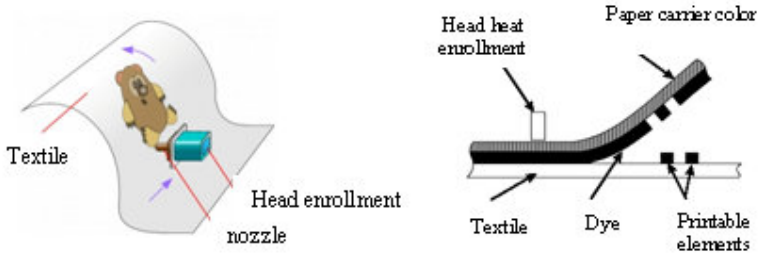

Fig. 1: *Printing digital technology [8]*
a - direct printing;
b - by indirect printing.

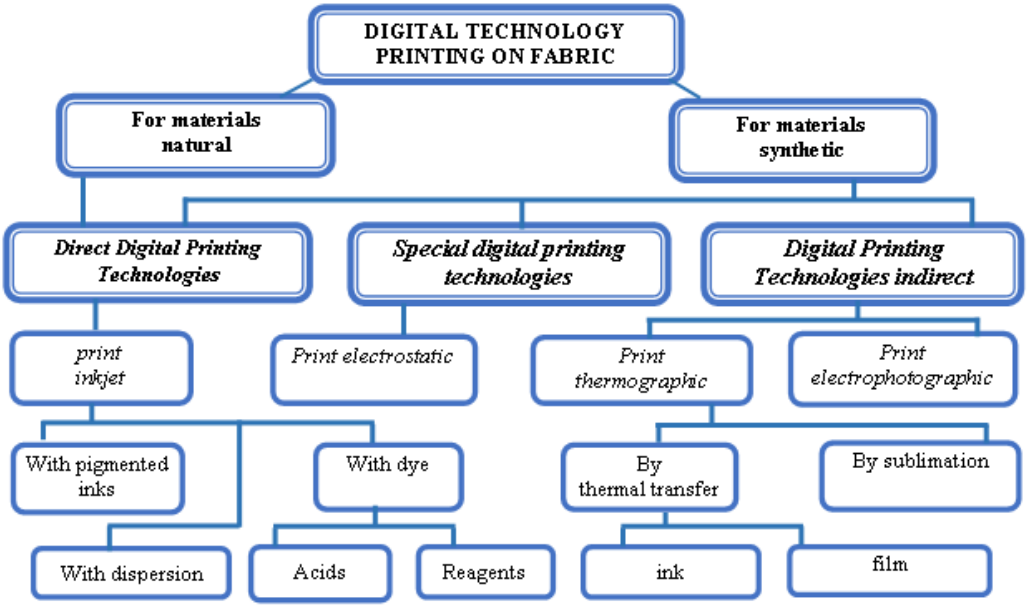

Fig. 2: *Digital technologies achieve prints on textiles*

For digital printing on textiles polyester using sublimation inks, most commonly water based. The pigments in the ink by heat (180-210 °C) going from the solid phase and gas phase entering the polyester fiber. This allows for: vivid colors, a good double sided penetration, high resistance to washing and UV radiation, the material keeping the flexibility and features original perceived tactile touch [1, 4].

For printing on textiles from natural fibers (cotton, silk, viscose, etc.) using reactive inks and acid inks. Attachment to a material requires post-treatment steam [1].

Digital printing on textiles requires the involvement of a minimum consumption of material and equipment (figure 3), customizing the following advantages:

- economic (buying a single machine and pay a single operator);
- technological (maximum precision inking);
- ecological (various chemical solutions used in traditional printing process pollute the environment);

• space (eliminating pre-press equipment, we have more space);
• temporals (making the graphical layout to produce the final product is only a few hours) [2, 3, 5-7].

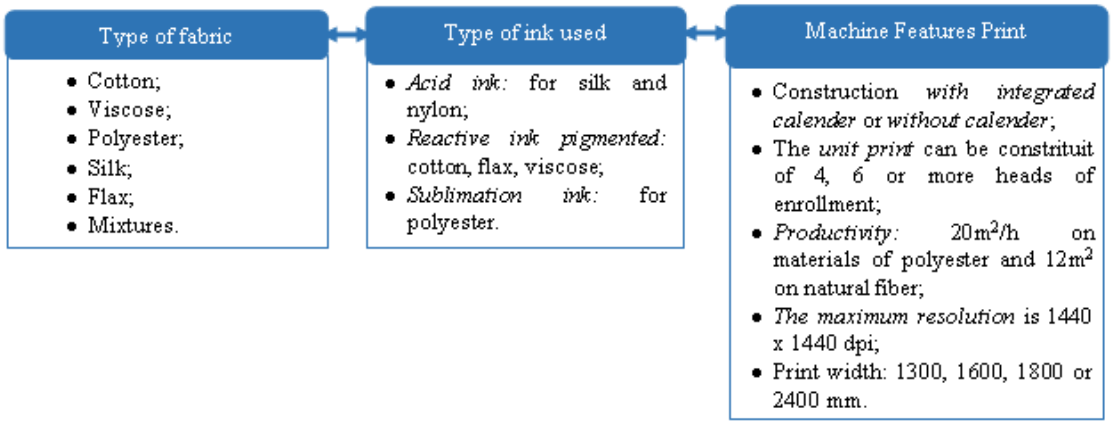

Fig. 3: *Peculiarities digital printing on textiles*

Analysis of the advantages of digital technology and traditional textile SWOT method is shown in figure 4 through specific elements common to both technologies.

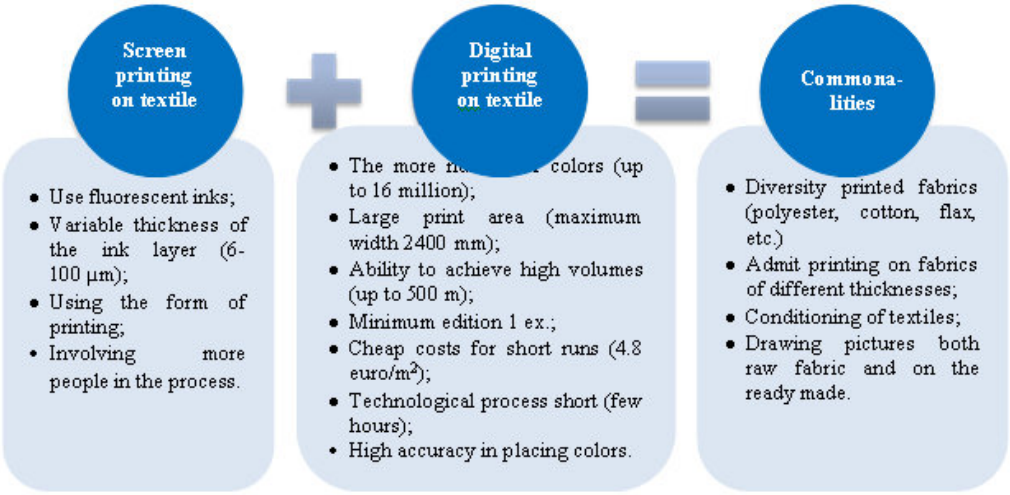

Fig. 4: *Specific and common aspects of screen printing and digital printing on textiles*

For digital printing, the process is much shorter, the aesthetic concept development (design) and to obtain printed fabric needed a few hours. The customer brings the file to the printer model in vector or bitmap format, and possibly material if it is to work with your own material. Make a test, and then after the confirmation date of the beneficiary, go to achieve the entire order. It is recommended to power the coil material previously treated, ensuring hydrophilicity required for better absorption. Subsequently, the material is treated with different substances for better adhesion of the ink. Finally, the fabric is printed like paper. Due solution which was treated material, it allows the ink to enter the fiber and a stain to get some clear, sharp images. After printing, followed by heat setting process, as well as conventional printing [2].

3. EVLUATION STRENGTH CHARACTERISTICS OF TEXTILE PRODUCTS TO VARIOUS REQUESTS

To assess the strength characteristics of printed textiles screen printing and digital technology were prepared by 10 types of materials (table 1, figure 5) for each printing method, with dimensions of 350×450 mm. Tests in laboratory analysis assumed vapor permeability zone print, hydrophilicity, resistance to dry friction and drapery prints.

Table 1: *Identity features cotton-containing fiber materials*

Marking	Coding	Fiber composition	Thickness (mm)	Mass, (g/m^2)	Density (threads/10cm)		Link	Width (cm)
					U	B		
110	**B 1.1**	100% C_0	0,21	101,59	290	260	canvas	152±2
190	**B 1.2**	100% C_0	0,27	141,87	290	250	canvas	152±2
750	**B 1.3**	100% C_0	0,22	118,73	260	220	canvas	152±2
350	**B 1.4**	100% C_0	0,245	132,93	290	250	canvas	152±2
230	**B 1.5**	100% C_0	0,23	129,67	280	250	canvas	152±2
550	**B 2.1**	98% C_0 2% LY	0,99	305,75	300	280	canvas	152±2
650	**B 2.2**	98% C_0 2% LY	0,85	287,32	280	280	canvas	152±2
1149/329	**B 3.1**	98% C_0 2% ES	0,61	264,20	400	160	canvas	152±2
1149/331	**B 3.2**	98% C_0 2% ES	0,31	124,50	380	140	canvas	152±2
932/257	**B 4.1**	70% C_0 30% PES	0,4	241,96	270	250	canvas	152±2

Table 2: *Vapor permeability (PV) materials-cotton*

Encoded material	Type of measu-rement	Coefficient of vaporization, μ, $g/m^2 \cdot h$					
		absolute, μ			relative, μ_0		
		μ_1	μ_2	μ_3	μ_{01}	μ_{02}	μ_{03}
B 1.1	1	1,27465	1,48403	1,56498			
	2				12,89353	13,73037	14,86610
B 1.2	1	2,15555	1,82615	1,60318			
	2				20,64216	18,19784	16,12809
B 1.3	1	1,51846	1,54415	1,45281			
	2				15,34210	15,38877	15,95085
B 1.4	1	1,86332	2,03112	1,83979			
	2				20,45928	22,66205	20,77736
B 1.5	1	1,57113	1,63045	1,27386			
	2				16,87791	17,85899	15,56217
B 2.1	1	1,27399	1,38594	1,83953			
	2				13,31625	13,97228	18,61219
B 2.2	1	1,27904	1,57190	1,79594			
	2				12,86243	15,84781	16,60413
B 3.1	1	0,97285	1,36283	1,43237			
	2				17,82751	19,25896	18,16196
B 3.2	1	1,50384	1,61748	1,77986			
	2				14,79539	15,94718	17,39672
B 4.1	1	1,57976	1,61003	1,54344			
	2				12,99709	14,53655	14,02254

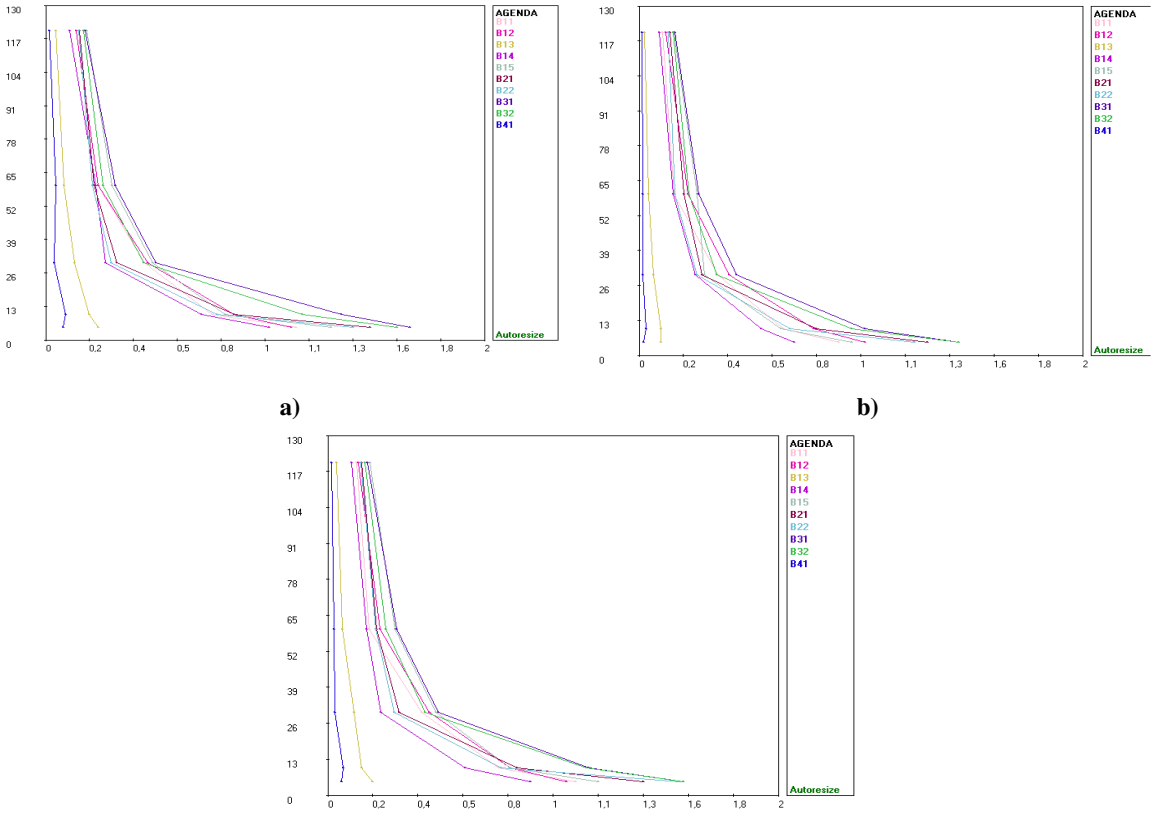

Fig. 5: *Hydrophilicity of cotton-type material*
a) in the warp direction;
b) the weft direction;
c) orientation under 45^0.

Table 3: *Attrition behavior by friction of materials-cotton*

Encoded material	Initial mass of the specimen, $m_{0,g}$	Initial thickness, $g_{0,mm}$	Number of rubbing cycles / min	Mass of the specimen after 20 min of friction, m_1 g	The thickness of the test specimen after 20 minutes of rubbing, $g_{1,mm}$	Loss of mass, P_m, g	Loss of thickness P_g, mm
B 1.1	7,177	0,217	60	7,072	0,112	1,4629457	48,3870968
B 1.2	10,231	0,273	60	10,116	0,212	1,1230464	22,3443223
B 1.3	8,388	0,225	60	8,282	0,197	1,2660642	12,4444444
B 1.4	9,392	0,245	60	9,278	0,172	1,2138636	29,7959184
B 1.5	9,161	0,232	60	9,069	0,185	1,0053378	20,2586207
B 2.1	21,597	0,991	60	21,396	0,721	0,9306848	27,2452069
B 2.2	20,299	0,857	60	20,127	0,795	0,8473324	7,2345391
B 3.1	18,665	0,613	60	18,544	0,573	0,6482722	6,5252855
B 3.2	8,795	0,314	60	8,670	0,288	1,4212621	8,2802548
B 4.1	17,094	0,452	60	16,959	0,407	0,7897508	9,9557522

4. CONCLUSIONS

Models of textile prints that were not possible in the past are now made available to everyone through avoiding demarcation color digital printing. Digital printing on textiles and knits are a superior alternative to screen printing, denoting several strong elements:

1. Quickness – from product design on calculator to the finished product is only one click.
2. Effectiveness – incredible customizations done on any difficulty level graphics.

3. Economic constraints related to complex manufacturing process (eg, site of each color) and the minimum number of copies (after all is not just a picture on the computer that is sent to print as many copies as necessary).
4. Myriad of colors - every ton of the color is achieved.
5. High vapor resistance, high hydrophilicity, medium strength dry friction.

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