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INTERFACING QUALITY ASSESSMENT TOOL BEFORE AND AFTER WASHING

TILOUCHE Rahma[1,*], BEN ABDJELIL Radhia[2], BEN HASSEN Mohamed [1-3]

[1]*Laboratory of Textile Engineering, University of Monastir, Tunisia*
[2] *Textile Material and Processes Research Unit, University of Monastir, Tunisia*
[3]*Industrial Engineering Department: University of Taibah; Saudi Arabia*

ABSTRACT

Interfacing is an inner construction material that lies between layers of fabric. Its primary purpose is to give stability, shape, and reinforcement to the fashion fabric. Thereby, it plays an extremely important role in the overall success of garments. The main goal of this paper it is to develop a quality assessment tool for interfacing in order to prevent quality issues during production. Four types of interfacing where tested on thirty-seven different waistbands made from denim fabric. Tests are carried out using three different machines, namely iron, fusing machine and fusing press. The samples were mainly evaluated according to the following criteria: aspect, adherence, elasticity, tearing and wrinkling. For all samples, each criterion is scored on a 4-point scale, ranging from 0=mediocre to 3=excellent. Then, a global interfacing acceptability level (GIAL) is calculated based on the specified criteria. According to this parameter, the interfacing can be accepted if its quality is judged as good or excellent. Otherwise, it is rejected and its quality is judged as mediocre.

KEYWORDS

Interfacing, denim fabric, quality assessment, decision tool, references.

1. INTRODUCTION

Interfacing is widely used in the apparel industry. In fact, “it constitutes a layer of fabric used between the outer fabric of a garment and its facing” (Hendrickson.K & al, 2009). Most garments look more professional and wear longer if they are interfaced. Generally, interfacing is used for adding bulk, reinforcement or also stabilizing a stretch fabric. Subsequently, more than one kind of interfacing may be used in a garment. Therefore, considerable attention should be paid to the selection of interfacing in clothing construction. In general, the choice of interfacing depends on where it will be used, and the effect and shaping desired (Stryker M. & al, 2005). In addition, interfacing must be compatible with the weight, care requirements and characteristics of the garment fabric. Indeed, it should be the same weight or slightly lighter than the garment fabric (Klumpp C. & al, 2010). Thus, in order to face the challenge of choosing the perfect interfacing, it would be useful to test a supply of different interfacings within the fabric range. Previous research has shown that the non-control of the interfacing properties makes the prevention of quality problems too difficult (Hackler.R & al, 2006). In this way, reliable and accurate quality control is an essential element in the apparel manufacturing process. The purpose of this work is to develop a decision support tool for interfacing quality assessment before and after washing. The remainder of this paper is organized as follows: Section 2 describes the materials and methods used. Section 3 outlines problem formalization and identification. Section 4 provides details of the interfacing evaluation board. Section 5 presents and discusses the results, and finally Section 6 concludes the paper.

*Corresponding author. Email : tiloucherahma86@yahoo.fr

2. MATERIAL AND METHODS

2.1. Collected samples

This work focuses on studying performance and technical specifications of interfacing quality by choosing the adequate machines parameters, and the perfect match interfacing- fabric. Four interfacing were selected to be tested, with different specifications.

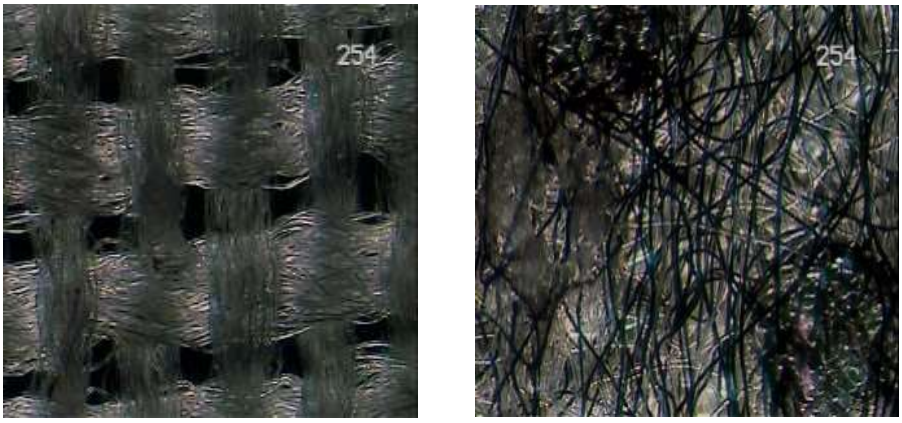


Figure 1: Example of microscopic view of non-woven and woven tested interfacing (Leica M50 ∗4)

Collected interfacing sample are summarized in Table 1.

Table 1: Interfacing sample characteristics

Code	Weight (g/m^2)	Type	Composition
9245	45	Non-woven	PES/PA
8525	33	Non-woven	100% PES
2775	50	woven	100% PES
8033	60	woven	100% PES

2.2. Interfacing equipment

In order to investigate the impact of machines on the interfacing quality, three fusing machines with varying characteristics were used, as shown in Table 2.

Table 2: Interfacing machine characteristics

Machine	Max pressure (Bar)	Heating time (s)	Max temperature
Iron	UN*	10-15	190°C
Fusing Press	12	5-30	240 °C
Fusing machine	1,5	5-20	220 °C
*UN : unidentified pressure for iron			

2.3. Tested fabric

Thirty-seven denim fabrics were selected for testing. They are either composed of a single fiber or blended. Samples were cut and sewed as waistbands. Table *3* recapitulates tested fabric characteristics.

Table 3: Sample characteristics

Code	Composition
GU 01	3% EA 27% PES 70% CO
GU 02	1% EA 3% PES 96% CO
GU 03	2% EA 16% CMD 16% PES 66% CO
GU 04	2% EA 98% CO
GU 05	2% EA 4%PES 94%CO
GU 06	1% EA 99% CO
GU 07	4% EA 8% PES 88%CO
GU 08	2% EA 8% PES 90% CO
GU 09	4% EA 11% EME 85% CO
GU 10	4% EA 8% PES 88%CO
GU 11	2% EA 98% CO
GU 12	100% CO
GU 13	2% EA 30% PES 68% CO
HB 01	2% EA 98% CO
HB 02	2% EA 5% LYO 25% PA 68% CO
HB 03	2% EA 98% CO
HB 04	2% EA 6% EME 92% CO
HB 05	2% EA 7% EME 91% CO
HB 06	2% EA 6% EME 92% CO
HB 07	2% EA 5% LYO 25% PA 68% CO
HB 08	2% EA 98% CO
HB 09	1,5% EA 17% PES 81,5% CO
HB 10	1% EA 5% PES 94% CO
HB 11	2% EA 6% EME 92% Coton
HB 12	100% CO
VF 01	100% CO
VF 02	100% CO
VF 03	100% CO
VF 04	100% CO
VF 05	1% EA 4% PES 95% CO
VF 06	100% CO
VF 07	2% EA 5% EME 93% CO
VF 08	100% CO
VF 09	100% CO
VF 10	100% CO
VF 11	100% CO
VF12	3% EA 27% PES 70% CO

2.4. Problem Formalisation and identification

2.4.1. Problem formalization

The aim of this stage is to framework the problems by identifying and describing them. This phase provides the direction-setting guidance for interfacing quality decision. In fact, it represents a work path (Figure 2) that can prevent problems from being achieved.

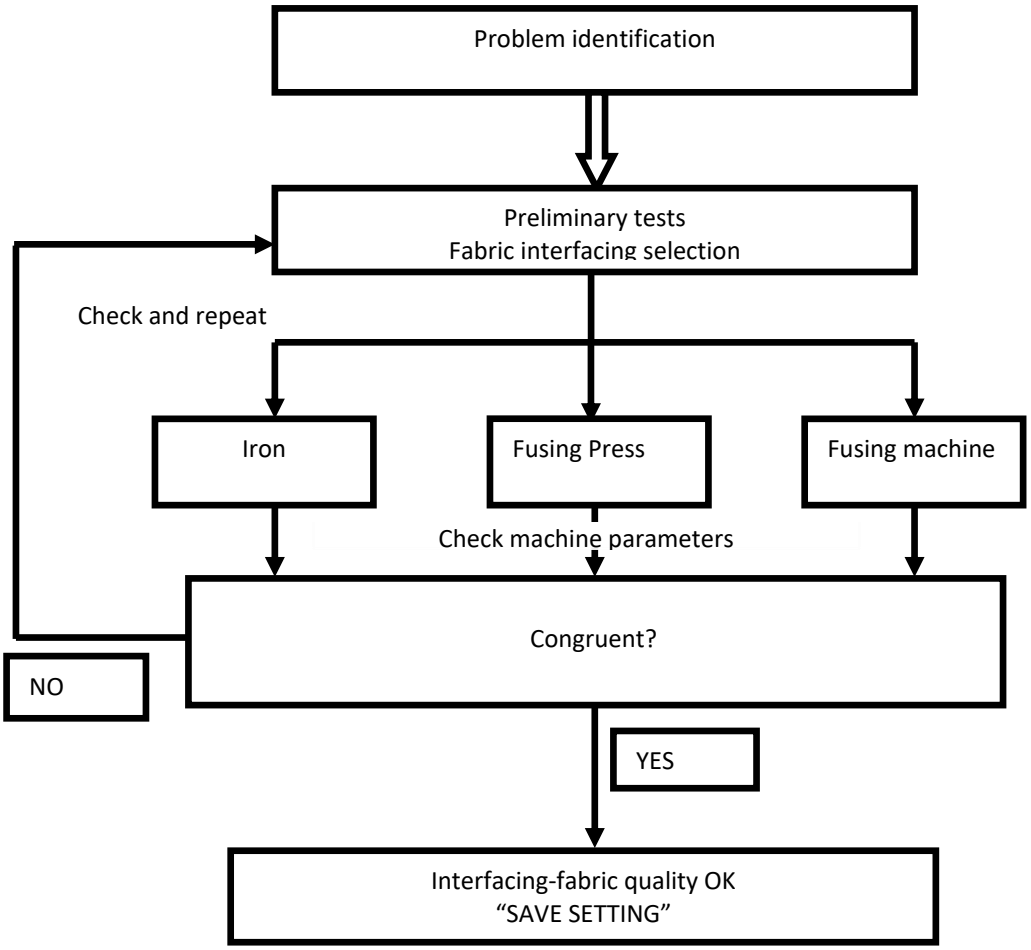


Figure 2: Scheme of work path.

2.4.2. Problems identification

In order to identify potential solutions, a clearly specified list of problems represents the most suitable basis.

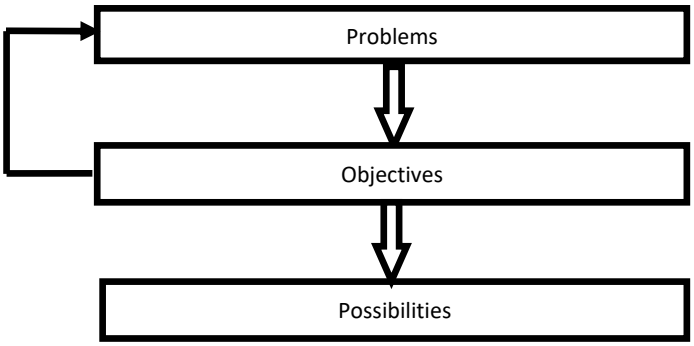


Figure 3: Problems, objectives and possibilities.

Problem identification provides the platform for investigating a broad range of interventions and generating options. According to Figure 4, non-adherent interfacing, apparent adhesive and apparent interfacing are the most common and repetitive problems respectively with 19%, 17% and 16%.

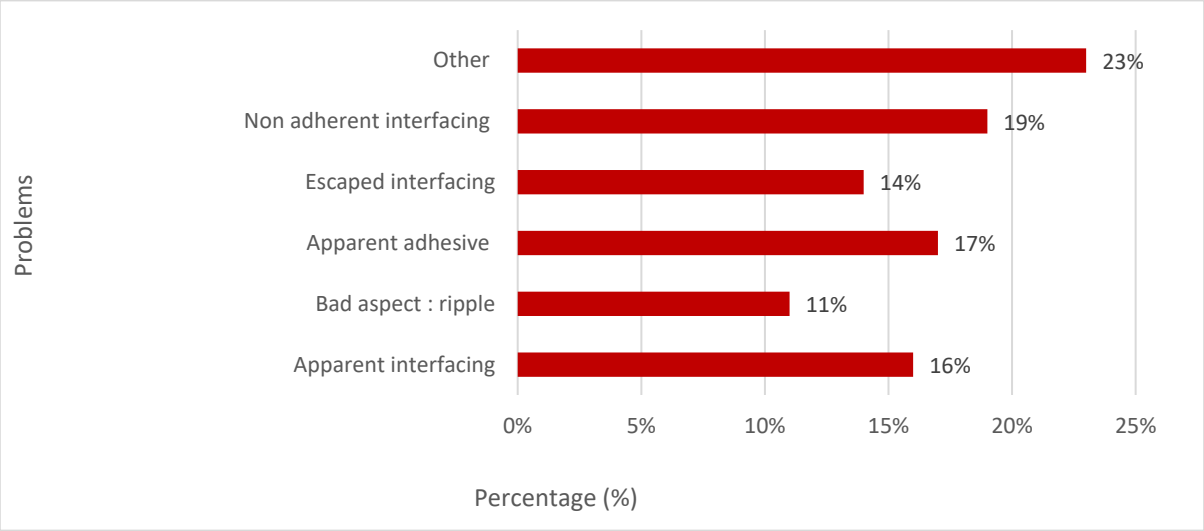


Figure 4: Histogram of the most repetitive interfacing problems.

Figure 5 shows real photos of the most repetitive problems related to interfacing.

Apparent interfacing

Bad aspect : ripple

Ragged interfacing

Escaped interfacing

Apparent adhesive

Non adherent interfacing

Figure 5: Real photos for problems related to interfacing.

2.5. ESTABLISHMENT OF INTERFACING EVALUATION BOARD

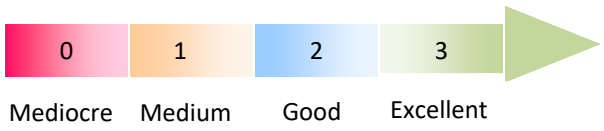
2.5.1. Rating system development

A method was developed to integrate the opinions of quality mangers according to five attributes: adherence, aspect, tearing, wrinkling and elasticity. Every sample is assessed before and after washing, in order to perceive problem whenever it appears.

Criteria for classifying each attribute on a scale of four intervals are respectively: mediocre, medium, good and excellent. (Table 4)

Table 4: Attributes and rating scale before and after washing

Aspect	Bad 0 1 2 3 Excellent
Adherence	Non adherent 0 1 2 3 Excellent
Elasticity	Bad 0 1 2 3 Excellent
Tearing	Teared 0 1 2 3 Non teared
wrinkling	wrinkled 0 1 2 3 Non wrinkled



2.5.2. Memory trigger references

For each descriptor, a specific definition and an assessment method were fixed. Moreover, an adapted reference was associated with a negative and a positive selection score for each attribute. It is used as memory trigger during rating sample before and after washing, in order to make defining the rating notation intensity easier. These references will help to delimit the rate that will be assigned for each descriptor from the fixed interval (0 to 3).Table *5* summarizes fixed references for each property.

Table 5: Reference table for each attribute.

Reference (+)	Reference (-)
Adherence	
	
Aspect	
	
wrinkling	
	
Tearing	
	

2.5.3. Interfacing acceptability level

All attributes were grouped, which touch the most the interfacing quality as mentioned in the previous section. For all sample, each attribute is scored on a 4-point scale ranging from zero to three (Table 4).

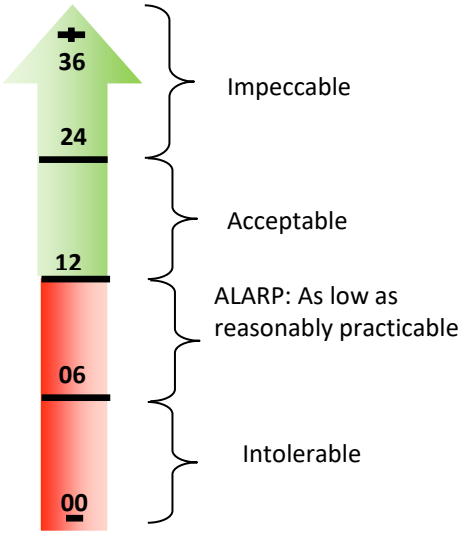


Figure 6: Interfacing quality severity key.

The global Interfacing acceptability level is calculated as "GIAL", which is the product of the adherence relative intensity (R_{Ad}) by the sum of relative intensity respectively of: aspect (R_{As}), elasticity(R_{El}), tearing (R_{Te}) and wrinkling(R_{Wr}). We shall write the above expression as:

$$GIAL=[R_{Ad} * \sum(R_{As} + R_{El} + R_{Te} + R_{Wr})] \qquad (1)$$

Individual rating degrees are joined together by type. In fact, there are two types of interfacing properties: basis fundamental properties, those related to adhesion performance. In addition, of properties related to mechanic performance and overall aspect fabric and interfacing. Hence, adhesion property has to be non-null. As a result, if individual rating of adhesion is equal to zero, GIAL will be zero.

3. RESULTS AND DISCUSSIONS

3.1. Machine parameter setting

Equipment	Interfacing	T(°C)	Time (S)	Pressure
Fusing machine	9245	138	6-7	1,5
	8525	138	6-7	1,5
	2775	150	6-7	1,5
	8033	150	6-7	1.5
Press	9245	150	15	3 Bar
	8525	127	10	3 Bar
	2775	140	13	3 Bar
	8033	135	13	3 Bar
Iron	9245	140	15	*UN
	8525	140	15	*UN
	2775	150	15	*UN
	8033	150	15	*UN
*UN : unidentified pressure for iron				

3.2. Results before washing process

All interfacing results of tested waistbands before washing are 100% compliant according to the established quality criteria.

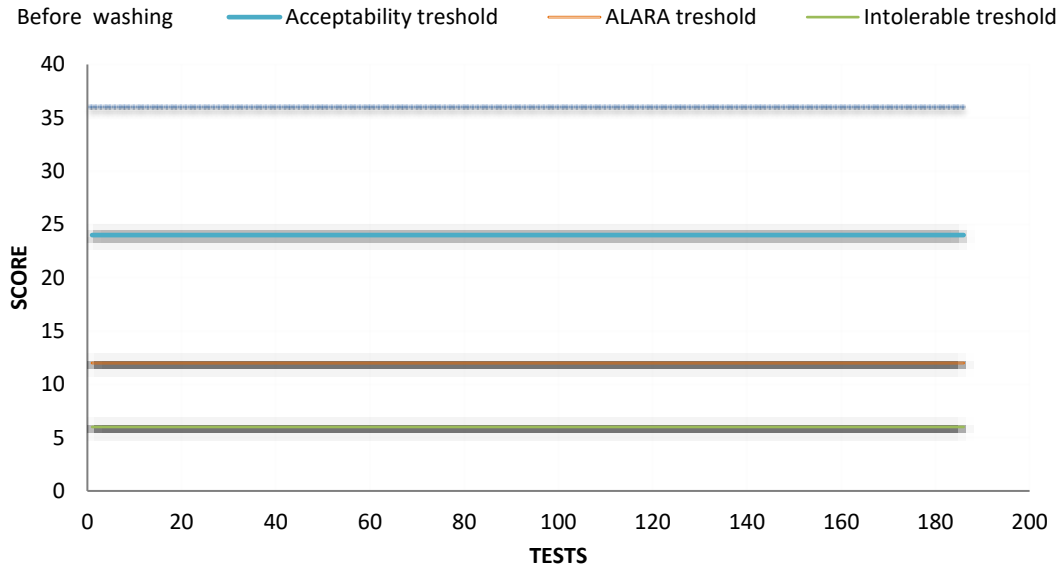


Figure 7: Results before washing process.

3.3. Results after washing process

In order to reproduce the similar conditions of denim trousers, stone washing is applied. Table 6 indicates the washing process parameters.

Table 6: Washing process recipe

Process	Time (min)
Preparation	5
Stone	20
Rinse	5
Dry	35 (170°C)
Softening	10
Dry	35

Washing influence: According to Figure 8, we can notice that 45% of samples are satisfactory respectively: 21% impeccable and 24% acceptable. Furthermore, 38% of waistbands are rejected. In fact, their "GIAL" is lower than the pre-established acceptability threshold. In addition, 21% of samples are as low as reasonably practicable. That is to say, that are slightly higher than the acceptance limit and should be compulsorily subject of reconsideration.

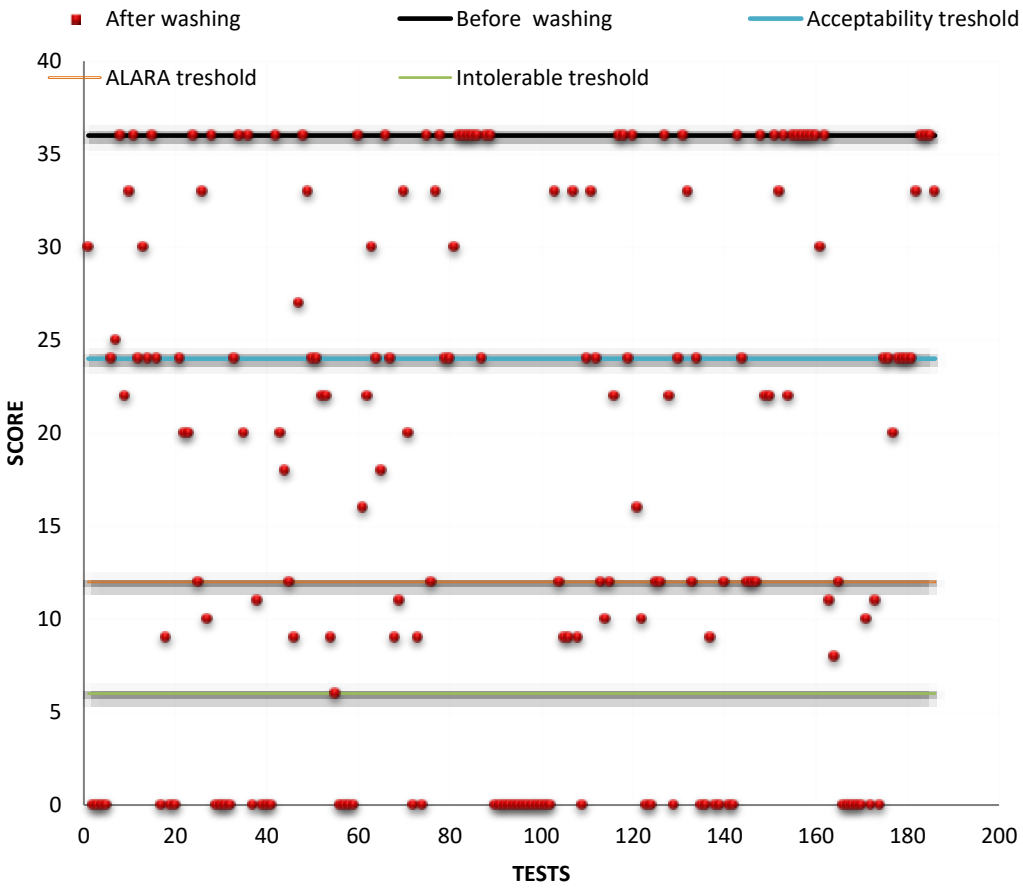


Figure 8: Results after washing process.

Equipment influence*:* According to Figure 9, all results shows that 81.43% of waistbands interfaced with iron are judged intolerable after washing. In fact, only 2.56% of samples are acceptable.

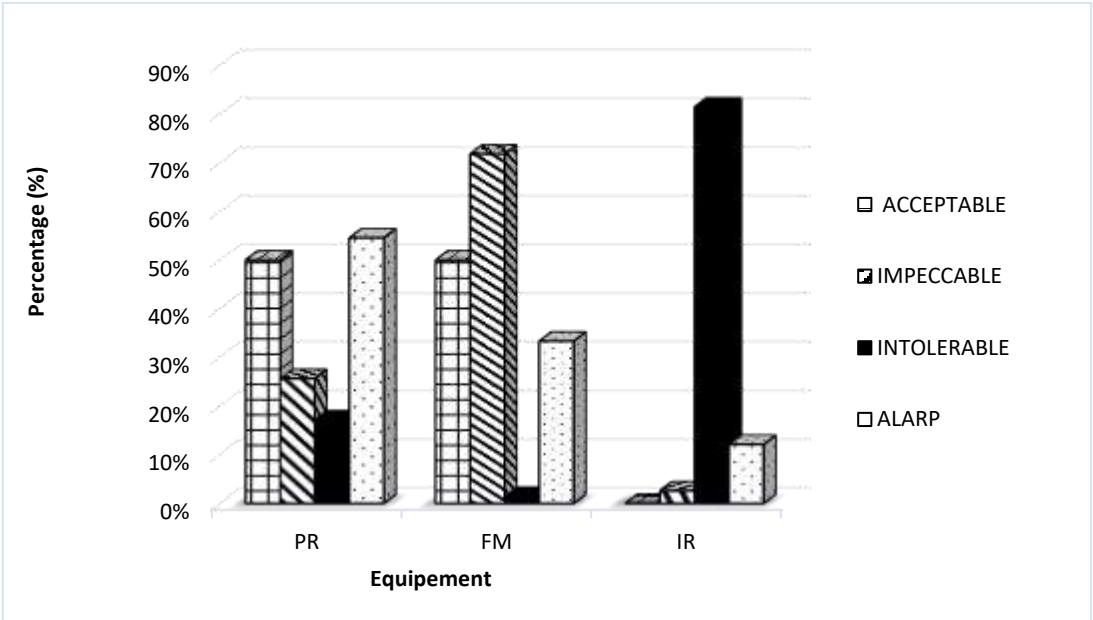


Figure 9: Equipment influence on results after washing process.

The obtained results using fusing machine are up to 98% accepted respectively: 50% acceptable, 71.79% impeccable and 33.33% reparable. In fact, only 1.43% are judged as intolerable. Besides, obtained results using the press are comparable with those obtained using the fusing machine. The tests are accepted up to 75%.

4. CONCLUSIONS AND RECOMMENDATION

From the research that has been carried out, it can be concluded that:

- It is forbidden to use the iron for the industrial interfacing operation;
- It is not enough to check the adherence quality with the naked eye, and thus, tear test is essential;
- Fusing and press machines have shown striking thermo-bonding properties.

The proposed method of interfacing quality assessment can be readily used in practice as a decision support tool, in order to avoid interfacing quality related issues. However, further investigation of fabric impact behavior is still required before obtaining a definitive answer to GIAL**.**

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