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Title: Implementation of quality control tools in the inspection-receipt area to reduce raw material rejections in electromechanical industries

Authors: SOTO-LEYVA, Yasmin, BONES-MARTÍNEZ, Rosalía and SANTOS-OSORIO, Arturo

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ECORFAN-México, S.C.
143 – 50 Itzopan Street
La Florida, Ecatepec Municipality
Mexico State, 55120 Zipcode
Phone: +52 1 55 6159 2296
Skype: ecorfan-mexico.s.c.
E-mail: contacto@ecorfan.org
Facebook: ECORFAN-México S. C.
Twitter: @EcorfanC

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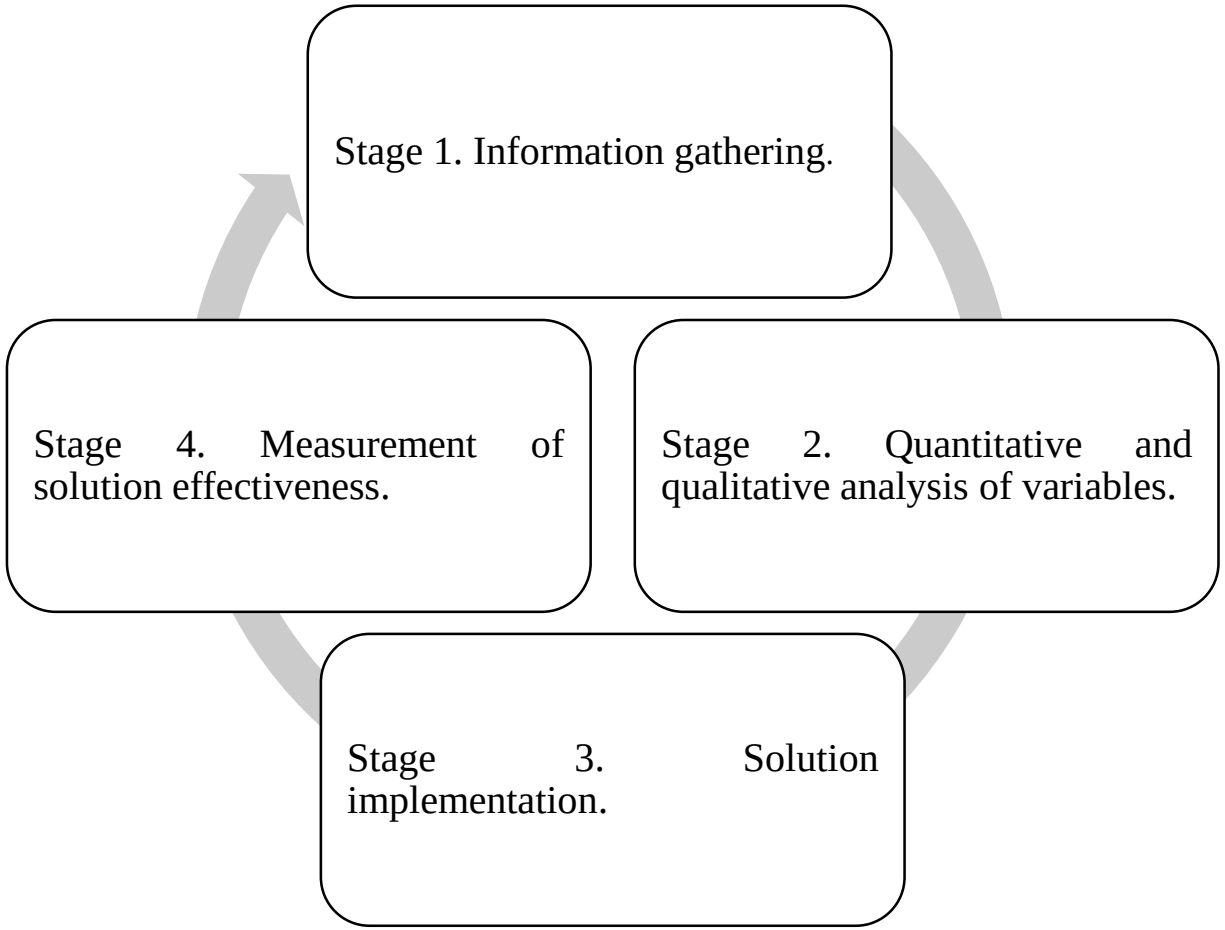
Introduction

The electromechanical industries in Mexico promote technological growth, contributing to the economic development of the country; These productive organizations are responsible for providing materials and supplies to different sectors, with the automotive industry being the one that mainly benefits from their operational activities. Specifically, in the country, the impact of the electromechanical sector is seen in the export processes of integrated circuits, printed circuits and software programming or translation (manufacturing, testing) concentrating the technological impulse in the formation of subassemblies of components and parts, which promote the effectiveness in the value chain of final tests, quality control and packaging (Ordóñez, 2005).

According to what has been described, there is a need to create effective methodologies that guarantee internal production processes, resorting to the conjunction of quality standards to eliminate the sources that originate raw material rejections, considering that the rejected inputs are those that do not comply with the required standards, causing production levels to decrease and products to be delivered outside the times established by customers, there are various sources that cause rejections, the main causes are: 1) Lack of standardization in quality control processes, 2) Null existence of audit plans, 3) Lack of training for personnel assigned to inspection processes in the area. If these factors are recurrent, the input input process will be incorrect, providing a high level of non-compliance for subsequent processes.
In accordance with the need raised in the previous lines, a system of standardization of quality controls is implemented in the receipt inspection area for the electromechanical industry, aligning the business goals with the objectives of the clients under an effective model of entry assurance. of raw material (polypropylene, polycarbonate, silicones, glass melamine, glass silicone, polyester film, etc.), making use of tools corresponding to quality control, which are: Audits (internal and external), check list, Ishikawa (Guzmán, 2019), these techniques are aimed at reducing raw material rejections by 5% and contributing to attracting customers by 5%, standardizing the reception process at a minimum level of 85% with regarding all the operational processes included in the area, programming that the benefit of the application be visible in the course of 2022 and be permanent as of annual period 2023.

Methodology

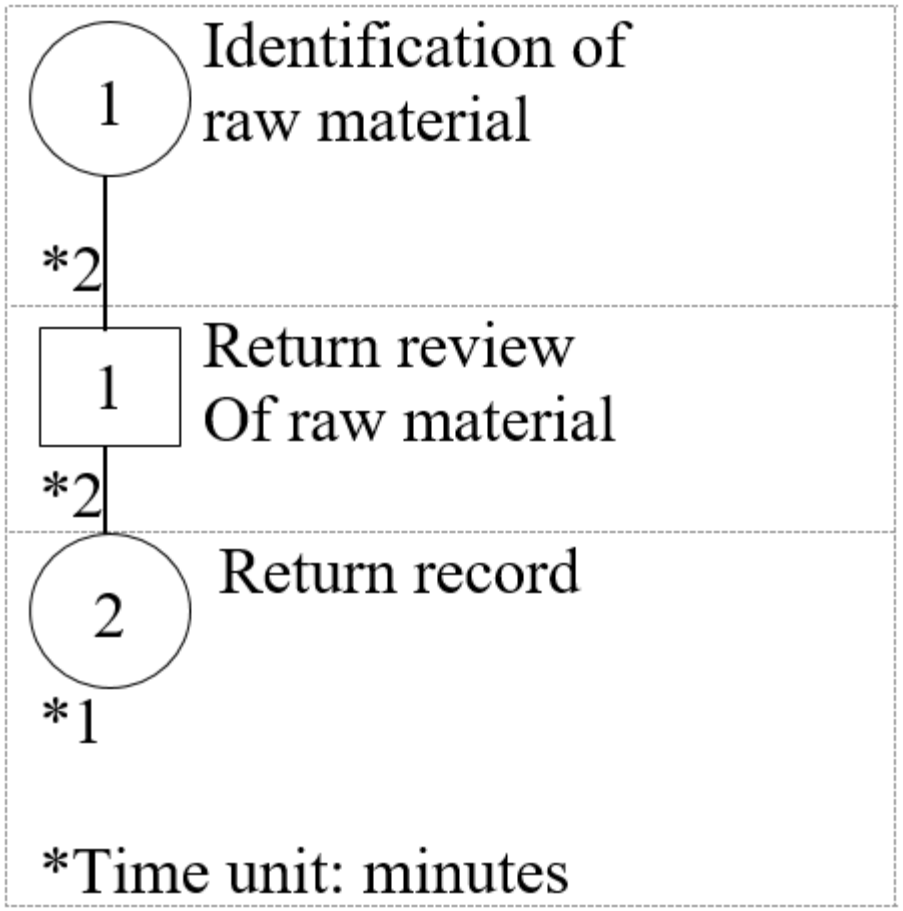
Figure 1. Stages of the methodological process for the development of the application



Source: Own elaboration

Stage 1: Gathering information

Figure 2. Gathering information



Source: Own elaboration

Stage 2: Quantitative and qualitative analysis of variables

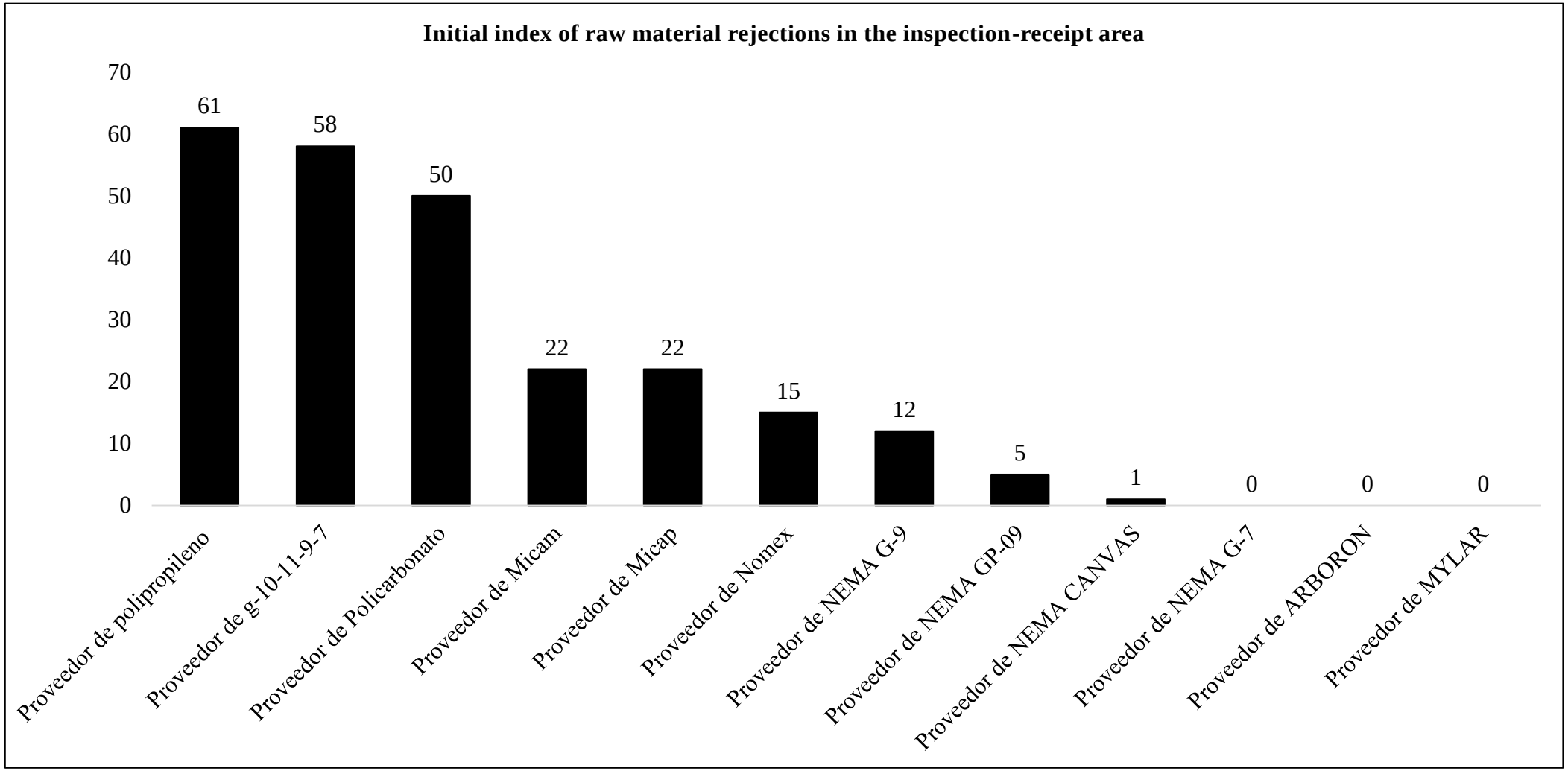
Table 1. Index of rejections by supplier 2021

Providers	Number of rejections initial status (lots)	Reported defect	% Accumulated
Polypropylene supplier	61	color fault	0.2479
g-10-11-9-7 supplier	58	color fault	0.4837
Polycarbonate Supplier	fifty	Porosity	0.6869
Micam provider	22	color fault	0.7764
Micap supplier	22	Porosity	0.8658
Nomex Supplier	fifteen	Porosity	0.9268
NEMA G-9 Supplier	12	color fault	0.9756
Supplier of NEMA GP-09	5	color fault	0.9959
Supplier of NEMA CANVAS	1	Porosity	1
Supplier of NEMA G-7	0	n/a	1
Supplier of ARBORON	0	n/a	1
MYLAR supplier	0	n/a	1

Source: Own elaboration

Stage 2: Quantitative and qualitative analysis of variables

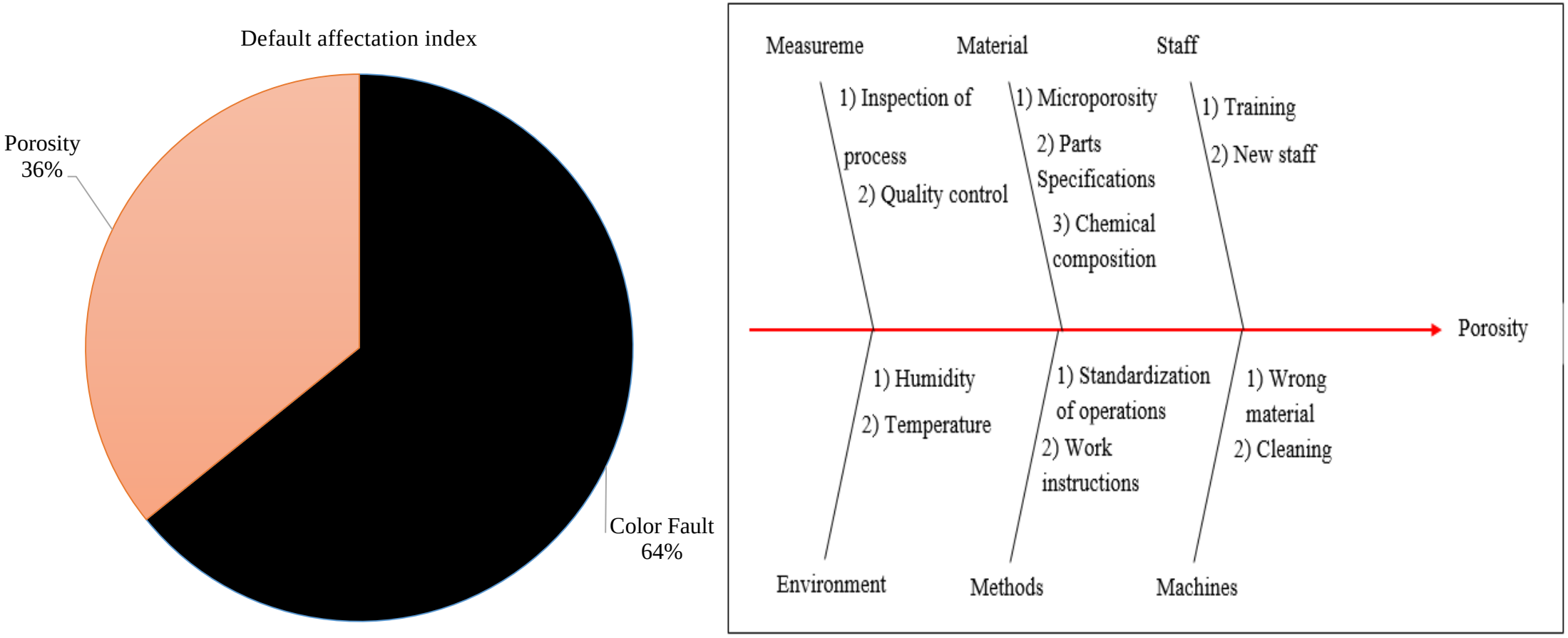
Figure 3. Index of raw material rejections in the inspection-receipt area



Source: Own elaboration

Stage 2: Quantitative and qualitative analysis of variables

Figure 4. Ishikawa Diagram. Analysis of potential causes for the generation of defects due to porosity



Source: Own elaboration

Stage 3: Implementation of solutions

Solution 1) Design and implementation of Check List

Figure 5. Check List of receipt of raw materials and supplies

business logo	**Company name** Home address: Warehouse location: Warehouse number:	Document No: Version: Date of admission: Elaborated: Revised:	
Check List: Receipt of raw material and supplies		Yes	No
1	Remove the padlock from the mid-trailer box.		
2	Check raw material according to the invoice.		
3	Use stop on the key once the trailer is positioned on the ramp.		
4	Unloading of raw material.		
5	Issue purchase order according to the invoice in Purchasing .		

Source: Own elaboration

Stage 3: Implementation of solutions

Solution 2) Internal process audit

Figure 6. Internal audit checklist

Business logo	**Internal process audit**	Document No.: MEX-F-
		Revision No.:01
		Issue date: 02-15-2021
		Review date:

Data			
W.O: _____	Part No.: _____	Machine: _____	Date: _____
Operator:	Area: Warehouse	Supervisor:	Turn:

Check list					
Nope:	**Questionnaire**	**Yes**	**No**	**N/A**	**Comments**
1	Does the material have a technical specification sheet? (color, thickness, material, size, etc.).				
2	Is the raw material arrival inspection carried out? (Check List according to the technical sheet of the material).				
3	Are the appropriate standards for the handling of raw materials complied with?				
4	Do the stocks have the correct identification tag?				
5	Is there an inventory control check-in/check-out system?				
6	Is the material identified with an expiration date?				

Results (1)

Table 2. Current status of suppliers

Providers	Traffic lights	Score obtained
Polypropylene supplier		90%
g-10-11-9-7 supplier		88.5%
Polycarbonate Supplier		92%
Micam provider		60%
Micap supplier		90%
Nomex Supplier		55%
NEMA G-9 Supplier		94%
Supplier of NEMA GP-09		74%
Supplier of NEMA CANVAS		89.4%
Supplier of NEMA G-7		95%
Supplier of ARBORON		95%
MYLAR supplier		95%

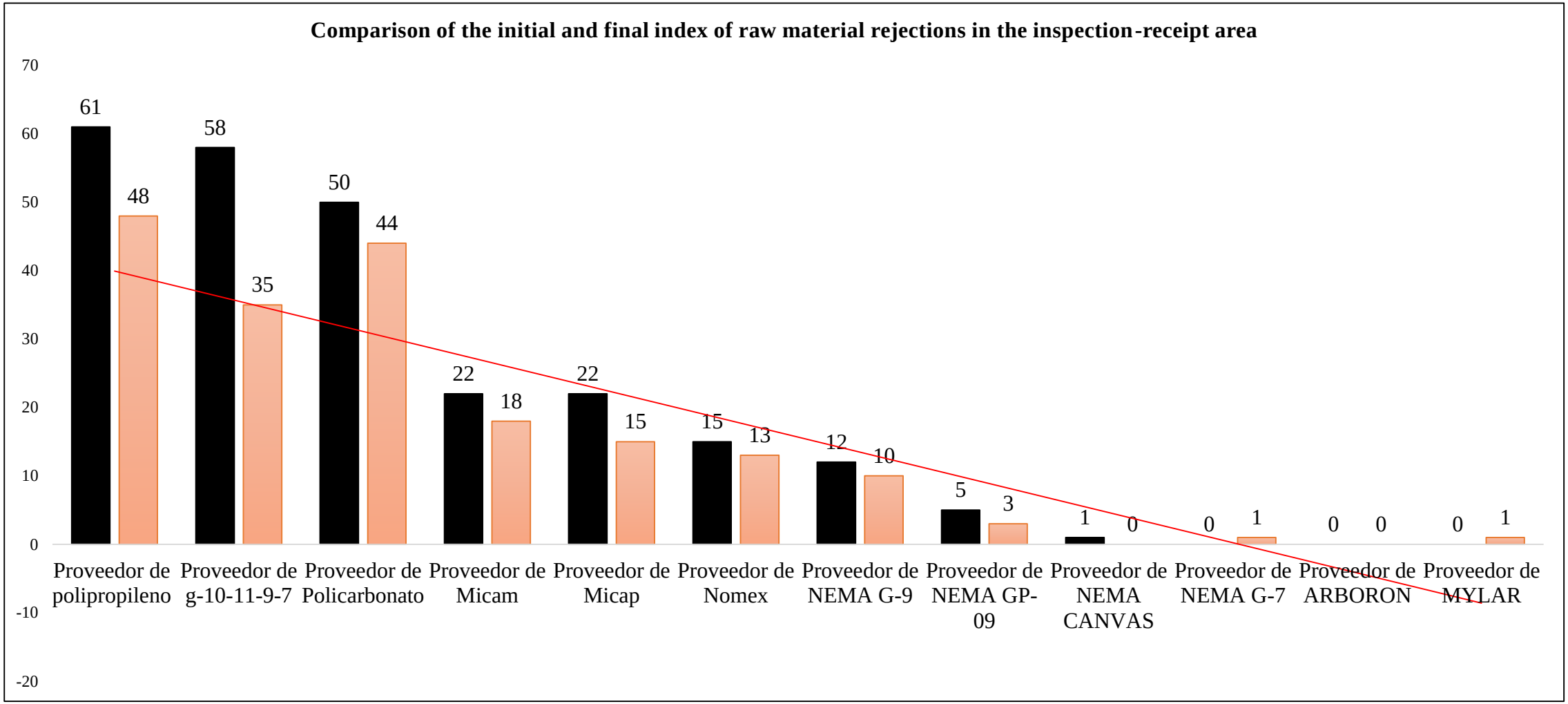
Table 3. Level of rejections in the inspection-receipt area

Providers	(lots) initial status	defect	(lots) final status (after application)	Reported defect	%
Polypropylene supplier	61	color fault	48	Color Fault (32)/Porosity (16)	
g-10-11-9-7 supplier	58	color fault	35	Color Fail (35)	
Polycarbonate Supplier	fifty	Porosity	44	Porosity	
Micam provider	22	color fault	18	Color fault/ Porosity	
Micap supplier	22	Porosity	fifteen	Porosity	
Nomex Supplier	fifteen	Porosity	13	Porosity	
NEMA G-9	12	color fault	10	color fault	

Source: Own elaboration

Results (2)

Figure 7. Comparison of the initial and final index of raw material rejections in the inspection-receipt area



Source: Own elaboration

Results (3)

Table 4. Cost analysis

	providers											
	Polypropylene supplier	g-10-11-9-7 supplier	Polycarbonate Supplier	Micam provider	Micap supplier	Nomex Supplier	NEMA G-9 Supplier	Supplier of NEMA GP-09	Supplier of NEMA CANVAS	Supplier of NEMA G-7	Supplier of ARBORON	MYLAR supplier
Initial cost per rejected lot	$345,621.15	$270,214.20	$195,600	$226,513.14	$254,300.18	$78,615.2	$93,745.19	$76,800.17	$10,400.22	$0.00	$0.00	$0.00
Cost achieved per rejected lot	$271,964.18	$163,060.29	$172,128	$185,328.93	$173,386.48	$68,133.17	$78,120.99	$46,080,102	$0.00	$23,600.12	$0.00	$11,500.24
Benefit achieved	$73,656.97	$107,153.91	$23,472	$41,184.21	$80,913.7	$10,482.03	$15,624.2	$30,720.06	$10,400.22	**-$23,600.12**	$0.00	**-$11,500.24**

Source: Own elaboration

Conclusions

This application demonstrates the importance of developing projects that control quality processes in transformation industries, according to the case evidenced, it is the inspection-receipt area that exposes the greatest problems, causing quantifiable economic losses, this as a result of a lack of standardization in operational activities caused the different suppliers to return to the area of origin with rejected shipments; With the implementation of quality controls (internal audit, check list, input control of raw materials and supplies, and labeling systems), 85% of operating activities were standardized. It is important to mention that in order to achieve the proposed benefits, a training process was carried out for the staff that was part of the auditing group, which would make up the internal commission to carry out the audits on a monthly basis, as well as for the application of the Check List. to the training of personnel (inspection-reception operators) who are in charge of receiving the raw material and supplies; Finally, a follow-up methodology was designed to avoid the generation of future rejections.

However, according to the results obtained, it is verified that the tools that structure quality control are effective techniques, which, when applied correctly, allow obtaining quantitative (economic) and qualitative (standardization-monitoring) benefits for organizations. transformation.

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