NEYART
Magazine
ISSN: 2992 - 7161

EVALUATION OF STEREOLITHOGRAPHIC PRINTING FOR PLASTIC SPARE PARTS IN INDUSTRIAL MACHINERY AND EQUIPMENT AS AN ALTERNATIVE, IN ADDITION TO TRADITIONAL METHODS USING MECHANICAL TESTING

EVALUATION OF STEREOLITHOGRAPHIC PRINTING FOR PLASTIC SPARE PARTS IN INDUSTRIAL MACHINERY AND EQUIPMENT AS AN ALTERNATIVE, IN ADDITION TO TRADITIONAL METHODS, USING MECHANICAL TESTS

Rubio Salazar Raúl
TecNM/Higher Technological Institute of Ciudad Acuña
https://orcid.org/0009-0009-4407-9324
2233PS0064@cdacuna.tecnm.mx

Aldape Rivera Lydia
TecNM/Higher Technological Institute of Ciudad Acuña
https://orcid.org/0000-0001-9305-0311
laldape@cdacuna.tecnm.mx

Pineda Rosales Diego De Jesus
TecNM/Higher Technological Institute of Ciudad Acuña
https://orcid.org/0009-0000-9155-1331
dpineda@cdacuna.tecnm.mx

Campos Oyervides Josué De Jesús
Center for Research in Applied Chemistry/CIQA
https://orcid.org/0009-0009-1855-6158
josue.campos@ciqa.edu.mx

Salcido Celada Mara Dennise
TecNM/Technological Institute of Ciudad
Juárez https://orcid.org/0009-0006-6754-0812
mara.sc@cdjaurez.tecnm.mx

DOI: https://doi.org/10.61273/neyart.v1i2.136 | **Received:** 09/09/2023 | **Accepted:** 14/10/2025 | **Published:** 15/11/2025

Abstract-- This research evaluates the feasibility and effectiveness of using stereolithography printing for the manufacture of industrial spare parts. To this end, mechanical properties such as tensile strength, impact, flexural strength, compressive strength, and softening temperature were analyzed, as well as the dimensional stability of printed parts. The tests were performed in accordance with the relevant ASTM standards, and the results were compared with traditional plastic standards. The average values obtained for the mechanical properties were equal to or higher than the standards in some cases, while the capability studies showed Cp and Cpk values greater than 1.33 for the width and length dimensions, and greater than 1 for the height dimension. This demonstrates that the process is capable of producing parts with dimensional accuracy and adequate mechanical properties, validating its use as a viable alternative for industrial replacements.
Keywords-- stereolithography, mechanical testing, printing, Cpk, ASTM standards, plastics.

Abstract-- This research evaluates the feasibility and effectiveness of using stereolithography 3D printing for the manufacturing of industrial spare parts. Mechanical properties were analyzed such as tensile strength, impact resistance, flexural modulus, compression strength, softening temperature, along with dimensional capability. Tests were conducted following the corresponding ASTM standards, and the results were compared with traditional plastic standards. The average values obtained for mechanical properties were equal to or higher than the standards in some cases. Capability studies showed Cp and Cpk values greater than 1.33 for width and length dimensions, and greater than 1 for height, demonstrating the process's ability to produce dimensionally accurate parts with adequate mechanical properties. These findings validate stereolithography as a viable alternative for industrial replacement applications.
Keywords-- Stereolithography, Mechanical Testing, Printing, Cpk, ASTM Standards, Plastics.

INTRODUCTION

Industry today constantly faces the challenge of keeping its equipment in optimal working order to ensure production efficiency. However, the availability of specific spare parts and the rapid replacement of deteriorated or damaged parts represent a significant obstacle.

According to ABB's new "Value of Reliability" survey, more than two-thirds of industrial companies experience unplanned downtime at least once a month, costing the typical company about $125,000 per hour.

According to Sapio Research (2023), a survey was conducted gathering responses from 3,215 plant maintenance managers worldwide in the power generation, plastics, rubber, oil, gas, wind, chemical, rail, utilities, marine, food, beverage, metals, and wastewater sectors. It is part of a report that provides information on how companies currently manage maintenance and how they can reduce unplanned downtime.

In this context, the fundamental question arose: can stereolithography printing technology be a viable, fast, and cost-effective alternative solution for obtaining spare parts in industry? Current scientific literature has extensively documented the capabilities of stereolithography in terms of resolution and design.

This research set out to evaluate the feasibility and effectiveness of using stereolithography printing as a method for manufacturing equipment spare parts. The aim was to analyze the capabilities of this technology in terms of precision, strength, and durability, with the objective of determining whether it could be a practical alternative to replace original spare parts. The importance of this research lies in its potential to improve the time and cost of replacing spare parts in industry, even when production and logistics costs are not directly addressed.

The industry allocates between 8% and 60% of the sale price to logistics issues (Jarzemskis A. 2025). This study seeks to offer a comprehensive solution to the challenges faced by companies in this sector. By exploring stereolithography printing technology and its specific application in the manufacture of spare parts, this research not only seeks to solve practical problems in the industry, but also to provide a more detailed and up-to-date understanding of its potential and best practices. This, in turn, can have a positive impact on the economy, operational efficiency, and the ability of companies to maintain jobs and operations in a highly competitive and constantly evolving market.

This work seeks to forge a path forward for those who seek to take advantage of stereolithography printing, as it defines a methodology that can be used in different variants, i.e., different types of plastics and different types of resin to be evaluated, using the basic hypothesis proposed in this research for this purpose. The average values for tension, impact, flexural strength, softening temperature, and compression obtained from the plastic test specimens are equal to or greater than the standard values for some of the plastic types in the sample.

General objective

To evaluate the possibility and effectiveness of using stereolithography printing for the manufacture of plastic replacement parts for industrial equipment.

Specific objectives

- To analyze the capabilities of resin stereolithography printing to replace original spare parts, providing detailed information on the technical capabilities of printing.
- Conduct a detailed dimensional capability study to evaluate and analyze the accuracy of the dimensions obtained through the resin stereolithography printing process, comparing them with the expected or designed dimensions.

JUSTIFICATION

The research focuses on studying an alternative for replacing spare parts by analyzing the mechanical properties of five samples in order to conduct pilot tests for printing them using stereolithography, evaluating the strength and precision parameters of the parts, as well as response times, demonstrating the efficiency of this new replacement method. This research is useful in providing an innovative solution for the manufacture of spare parts, benefiting various industries. The significance of this research for society is significant, as it addresses critical issues in the industrial supply chain and maintenance that directly impact job creation and retention.

Many sectors could benefit, including but not limited to manufacturing, industrial maintenance, automotive, aerospace, and medical companies.

The most tangible benefit will be that companies will be able to reduce costs and downtime, maintaining efficient and competitive operations by contributing to the reduction of logistics costs related to the transportation of parts by traditional methods compared to printing at the point of use.

This research will help solve several practical problems, such as:

- Shortage of Spare Parts: It allows the manufacture of specific parts on demand, especially for older or customized equipment.
- Customization and Complex Design: It facilitates the creation of customized parts with complex designs, which are essential in many industrial applications.

The research will fill several knowledge gaps as the results could be generalized to develop broader principles about additive manufacturing and its applicability.

The information obtained can also be used to review, develop, or support existing theories on 3D printing and stereolithography. In addition, it will provide greater insight into the behavior of variables such as strength, cost, and time in the manufacture of parts. Not to mention that it offers the possibility of in-depth exploration of the efficiency of stereolithography in various industrial environments, as well as suggesting ideas, recommendations, and hypotheses on advanced manufacturing technologies.

The research will also contribute methodologically, as it could help create new instruments for collecting and analyzing data on stereolithography manufacturing and will contribute to the definition and understanding of concepts related to 3D printing and the variables involved. It will achieve improvements in the way stereolithography printing is experimented with, optimizing the process. It will suggest how to more adequately study industrial populations that use this technology.

DEVELOPMENT

This research is applied in nature, with an exploratory, quantitative, experimental design and a deductive approach (Sampieri, et al. 2014). Derived from the purpose of this research, which is to achieve a specific objective by attempting to test the stereolithography printing method as an option for obtaining spare parts for equipment, with a very specific application in the industrial sector and addressing a specific problem, it can be determined that this is primarily applied research, since, as mentioned (Sampieri et al., 2014, p. XXIV), if scientific research fulfills one of the fundamental purposes of solving problems, it is considered applied research, of the exploratory type, since this type of technology is of recent creation and there is still a long way to go (Sampieri et al., 2014, p. 91).

The research should focus on topics or problems that have been little studied, but it must yield conclusive results for this application of stereolithography. This research is based on the information provided by the tests, so it should be considered quantitative, as it it uses data collection to test hypotheses based on numerical measurement and statistical analysis, in order to establish behavioral patterns and test theories (Sampieri et al., 2014, p. 4).

Experiments were carried out to obtain the values of the proposed variables, which indicates that the research will be experimental in nature, in addition to studying the dimensional capacity of this alternative (Sampieri et al., 2014, p. 129) defines experimental as the intentional manipulation of an action to analyze its possible results. By attempting to verify the use of a new method of replacing spare parts, an attempt is made to establish a general law that is considered to occur in particular situations. This is a sign that it is deductive research, which is based on a quantitative approach and the deductive paradigm (Sampieri et al., 2014, p. 129).

Using SolidWorks (2024)® software, each of the different test tubes required was designed according to the specifications. Halot Box software (see 3.5.6) was then used to print them on the HALOT ONE® printer from CREALITY®, using ABS-Like Resin Pro2®.

A form is designed for each of the mechanical properties to be recorded, indicating the characteristics of the resin such as name, batch number, and test date. The form requests information specific to each of the test specimens and provides space for the values that will be obtained in the testing laboratory for each of the five test specimens.

The data collection process was as follows:

- Consultation of ASTM International and ISO standards, beginning with a review of regulations and standards applicable to the evaluation of materials and dimensions, such as ASTM and ISO. This stage allows the measurement parameters and test conditions to be defined.
- Sample design using SolidWorks (2024) software: the samples to be printed are designed, ensuring that they comply with the established dimensions and geometries. CAD modeling programs are used to generate the required files.
- Printing of samples: the test pieces are manufactured using 3D stereolithography printing, and measurements are taken of the printed samples to evaluate their dimensional accuracy and the mechanical properties described above.
- Measurement: for data collection, the values of the mechanical properties of the test specimens were obtained in a laboratory using the procedures described in the appropriate standards.

specialized. Using the procedures for this purpose, the values were fed into the database and compared with the values established with the support of the Center for Research in Applied Chemistry (CIQA) through the Laboratory Services Coordination, which performed the corresponding mechanical tests on the test tubes.

- Evaluation: The data obtained were analyzed and presented in a technical report, using Minitab (2019) ®software (Minitab, Inc., 2019), compiling the descriptive statistics for each of the properties.
- Results. Once the results of both the mechanical tests and dimensional measurements were obtained, in the first case, the results were compared with the baseline information obtained from the results of these same mechanical tests, but in plastics from which the original spare parts are manufactured. In this way, it is determined whether the values are comparable. In the case of the capacity study, once the parts were manufactured, they were measured with precision instruments to record deviations from the original design. The data obtained was statistically analyzed using process capability studies (Cp and Cpk), allowing the degree of precision and repeatability of the technology to be quantified in terms of industrial requirements.

DISCUSSION AND ANALYSIS OF RESULTS

By making the corresponding comparative graphs between the minimum values, maximum contrasted with the average value of the printed resin specimens, information can be observed.

Table 1. *Mechanical test values for the main plastics*.

		ASTM	D256			D638			D695			D790			D1525		
			Impact (J/m)			Tension (MPa)			Compression (MPa)			Flexural strength (MPa)			Softening temperature (°C)		
Item	Material	Name	Value Min	Max value	Avg	Min Value	Max Value	Avg	Value Min	Max value	Avg	Min. Value	Max value	Avg	Value Min	Max value	Avg
1	High-density polyethylene	HDPE	2	53400	81	11	43	26	20	20	20	280	1860	1140	64	194	121
2	Low-density polyethylene	LDPE	34	53400	192	7	65	11	5	10	8	25	3310	264	52	129	90
3	Polypropylene	PP	2	145	73	4	369	32	40	40	40	26	10,000	1430	35	160	122
4	Vinyl Chloride Monomer	PVC	30	2840	636	30	52	43	50	80	65	1650	3310	2670	68	91	77
5	Polyethylene terephthalate	PET	14	10000	103	6	147	74	80	80	80	138	12,800	3660	74	85	80
6	Polystyrene	PS	11	214	46	4	59	32	70	70	70	894	3600	2680	70	108	95
7	Polyamide	Nylon	30	264	147	3	105	64	55	55	55	100	13,700	2380	70	302	193
8	Acrylonitrile Butadiene Styrene	ABS	10	785	241	2	77	45	65	65	65	24	6890	2330	45	160	100

Source: *MatWeb, n.d.* (2024).

The graphs show in green all the values in which the average value obtained in the laboratory tests is at least equal to one of the values of the different plastics used as samples. This indicates that in some cases, the printed resin can be used as a replacement for manufacturing spare parts in industry.

Item	Material	Name	Impact (J/m) ASTM D256 Minimum Value	Prom
1	High Density Polyethylene	HDPE	2	81
2	Low-density polyethylene	LDPE	34	192
3	Polypropylene	PP	2	73
4	Polyvinyl chloride	PVC	30	636
5	Polyethylene terephthalate	PET	14	103
6	Polystyrene	PS	11	46
7	Polyamide	Nylon	30	147
8	Acrylonitrile Butadiene Styrene	ABS	10	241
	Printed Resin Specimen			26.77

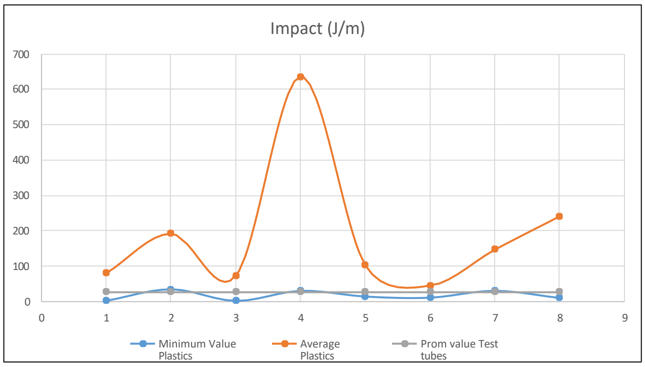


Figure 1. *Comparative graph of impact resistance values.*

Source: *Own elaboration* (2025).

Item	Material	Name	Tension (MPa) ASTM D638 Minimum Value	Prom
1	High-density polyethylene	HDPE	11	26
2	Low-density polyethylene	LDPE	7	11
3	Polypropylene	PP	4	32
4	Polyvinyl chloride	PVC	30	43
5	Polyethylene terephthalate	PET	6	74
6	Polystyrene	PS	4	32
7	Polyamide	Nylon	3	64
8	Acrylonitrile Butadiene Styrene	ABS	2	45
	Printed Resin Specimen			16.53

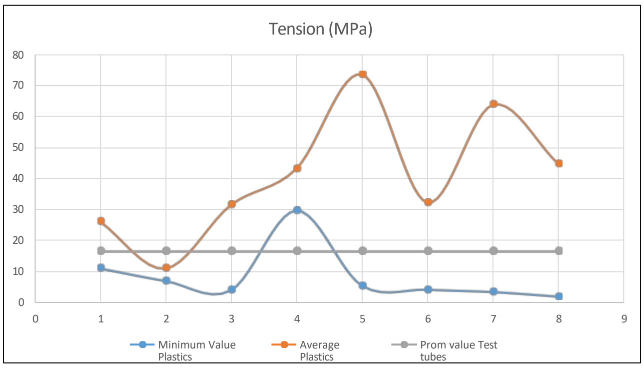


Figure 2. *Comparative graph of tensile strength values.*

Source: *Own elaboration* (2025).

Item	Material	Name	Compression (MPa) ASTM D695 Min value	Average
1	High-density polyethylene	HDPE	20	20
2	Low Density Polyethylene	LDPE	5	8
3	Polypropylene	PP	40	40
4	Polyvinyl chloride	PVC	50	65
5	Polyethylene terephthalate	PET	80	80
6	Polystyrene	PS	70	70
7	Polyamide	Nylon	55	55
8	Acrylonitrile Butadiene Styrene	ABS	65	65
	Printed resin specimen			39.14

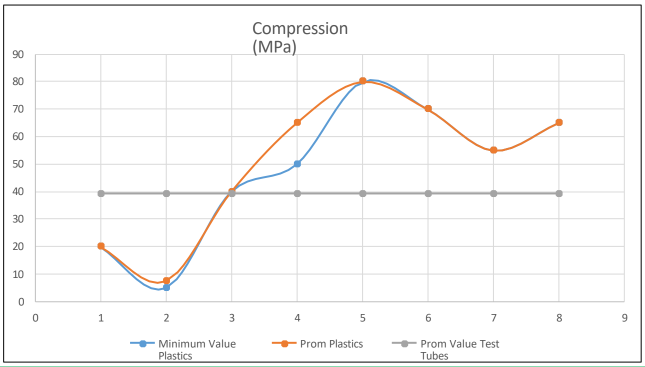


Figure 3. *Comparative graph of compressive strength values.*

Source: *Own elaboration* (2025).

		ASTM	D790	
			Flexural strength (MPa)	
Item	Material	Name	Min value	Prom
1	High-density polyethylene	HDPE	280	1140
2	Low-density polyethylene	LDPE	25	264
3	Polypropylene	PP	26	1430
4	Polyvinyl chloride	PVC	1650	2670
5	Polyethylene terephthalate	PET	138	3660
6	Polystyrene	PS	894	2680
7	Polyamide	Nylon	100	2380
8	Acrylonitrile Butadiene Styrene	ABS	24	2330
	Printed Resin Specimen			554.30

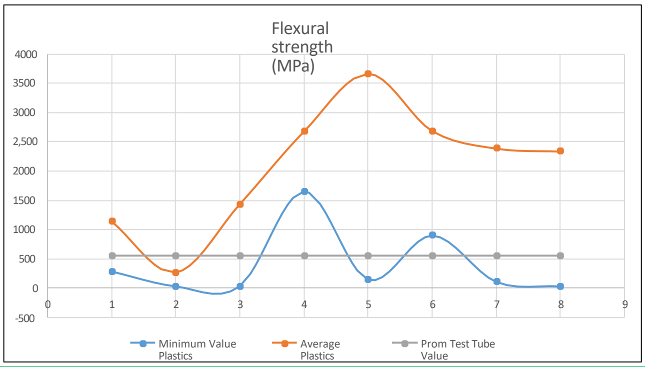
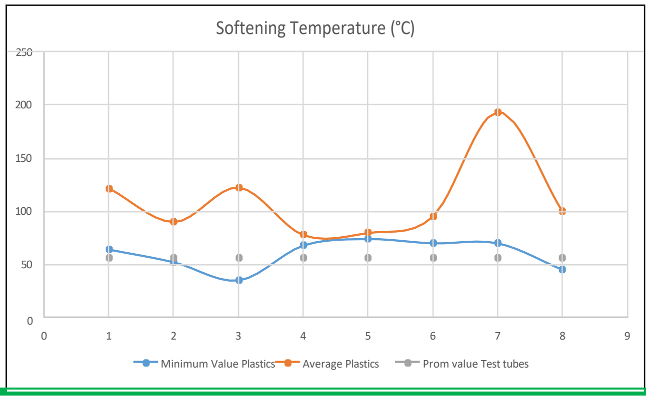


Figure 4. *Comparative graph of flexural modulus values.*

Source: *Own elaboration* (2025).

Table 5. *Comparative chart of softening temperature values.*

		ASTM	D1525	
			Softening temperature (°C)	
Item	Material	Name	Min value	Average
1	High-density polyethylene	HDPE	64	121
2	Low Density Polyethylene	LDPE	52	90
3	Polypropylene	PP	35	122
4	Polyvinyl chloride	PVC	68	77
5	Polyethylene terephthalate	PET	74	80
6	Polystyrene	PS	70	95
7	Polyamide	Nylon	70	193
8	Acrylonitrile Butadiene Styrene	ABS	45	100
	Printed Resin Specimen			55.33



Source: *Own elaboration* (2025).

With regard to the dimensional capability study, capability studies were performed for each of the 32 printed samples, and the following results were obtained:

For the Width and Length variables, the Cp and CPk values are greater than 1.33, indicating that these variables are under control. For the Height variable, the values are greater than 1, indicating that it is under control but requires monitoring and follow-up.

With these values, it can be concluded that the printed parts have the capacity to be a replacement alternative for the plastic spare parts used in the industry.

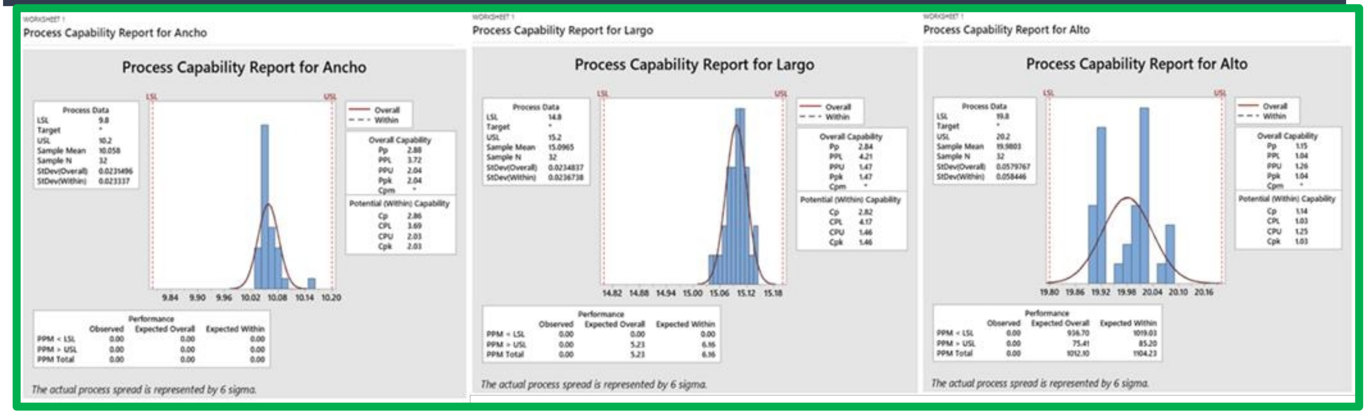


Figure 6. *Capacity study graph for the Width, Length, and Height variables.*

Source: *Own elaboration.*

The results obtained are consistent with previous research on the mechanical capabilities of stereolithography (SLA). According to Gebhardt (2016) and Gibson (2015), parts manufactured using this method have dimensional accuracy and properties comparable to injection-molded polymers when ABS-type resins or photopolymer-reinforced resins are used.

Likewise, studies by García (2019) and Smith (2018) support the fact that 3D printing using SLA allows for the production of materials with stable and reproducible mechanical behavior, provided that the curing and temperature variables of the process are controlled. The CP and CPK values obtained in this study (greater than 1.33 in width and length) coincide with the results described by these authors, who emphasize that a dimensional deviation of less than 2% is acceptable for precision mechanical applications.

CONCLUSIONS

It can be determined that the average values for stress, impact, bending, softening temperature, and compression obtained from the plastic test specimens are equal to or greater than the standard values for any of the types of plastic in the sample. The capability study also demonstrated that the Cp and CPk values for the width, length, and height dimensions of the printed sample parts are equal to or greater than 1.

Therefore, we can answer our research questions:

1.- Are the mechanical properties of the printed parts comparable to the mechanical properties of parts obtained by traditional methods?

Yes, since it has been demonstrated that the values for some cases are equal to or greater than

2.- Is the stereolithography printing process capable of producing dimensionally correct parts?

Yes, since it has been demonstrated that the process is capable of producing parts that meet the expected dimensions.

And finally, our question:

Is the use of stereolithography printing viable as a replacement alternative for obtaining plastic spare parts used in industry?

Yes, since the results demonstrate viability and capacity, making this replacement alternative valid.

The main objective of this research was to evaluate the viability of stereolithography printing. The results showed that the material has mechanical properties comparable to the materials used in the manufacture of plastic spare parts obtained by traditional methods. The capacity of printing from a dimensional point of view was also demonstrated.

These findings confirm stereolithography printing as a viable and capable alternative for producing plastic spare parts. However, further study is required on some other resins that may offer higher mechanical property values.

FUTURE WORK

Stereolithography printing shows great potential for replacing plastic parts in industry, although further research is needed to optimize its processes and evaluate its long-term performance with different types of resins, in addition to printing pilot parts for testing in processes, which could be followed up with experimental field research in the following contexts.

Strategic integration of additive manufacturing in the industrial supply chain.

A first follow-up to future work would be the line of research focused on the analysis of additive manufacturing as a strategy within supply chain management systems. It is proposed to evaluate the impact of its adoption on response time reduction, inventory management, environmental sustainability, and operational flexibility of companies (Garmulewicz et al., 2020). This approach could include the development of hybrid logistics models that combine traditional and additive manufacturing, as well as the analysis of associated key indicators (Holmström & Partanen, 2021; Tuck et al., 2023). This would contribute to the design of technology integration strategies that strengthen the competitiveness and innovation capacity of organizations in globalized industrial environments.

Optimization of printing parameters and development of advanced composite materials. Based on the analysis of the precision, strength, and durability variables of printed parts, a potential future line of research would be the study of stereolithography printing parameters, such as layer orientation, exposure to the light source, curing speed, and ambient temperature, in order to establish more precise relationships between these variables and the resulting mechanical properties (Zhao et al., 2023). In addition, it is suggested to investigate the development and application of photopolymer resins reinforced with composite materials or nanoparticles, with the aim of increasing the stiffness, dimensional stability, and thermal resistance of the manufactured parts (Li & Chen, 2022; Zhang et al., 2024). This type of research would make it possible to define optimal process and material configurations that strengthen the technical reliability of 3D printing in critical industrial applications.

REFERENCES

ASTM International. (2017). *ASTM D1525-17: Standard Test Method for Vicat Softening Temperature of Plastics*. ASTM International.

ASTM International. (2017). ASTM D790-17: *Standard Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials*. ASTM International.

ASTM International. (2018). *Standard Test Methods for Evaluating Properties of Polymer Matrix Composite Materials*. ASTM International.

ASTM International. (2022). *ASTM D638-22: Standard Test Method for Tensile Properties of Plastics*. ASTM International.

ASTM International. (2023). *ASTM D256-23: Standard Test Methods for Determining the Izod Pendulum Impact Resistance of Plastics*. ASTM International.

ASTM International. (2023). *ASTM D695-23: Standard Test Method for Compressive Properties of Rigid Plastics.* ASTM International.

Creality. (2024). *Halot Box* (Version 3.5.6) [Software].

Dassault Systèmes. (2024). *SolidWorks* (version 2024). Dassault Systèmes.

Garmulewicz, A., Holweg, M., Veldhuis, H., & Yang, A. (2020). Disruptive technology as an enabler of the circular economy: What potential does 3D printing hold*? California Management Review, 62*(3), 70–95. https://doi.org/10.1177/0008125620915888

Holmström, J., & Partanen, J. (2021). Digital manufacturing-driven transformations of service supply chains for complex products. *Supply Chain Management, 26*(4), 435–449. https://doi.org/10.1108/SCM-08-2020-0356

ISO (International Organization for Standardization). (1989). *ISO 2768-1:1989: General tolerances for linear and angular dimensions without individual tolerance indications*. International Organization for Standardization (ISO).

ISO (International Organization for Standardization). (2017). *ISO 22514-2:2017: Statistical methods in process control — Capability and performance — Part 2: Capability and performance of time-dependent processes*. International Organization for Standardization (ISO).

Jarzemskis A. (2025). *Fundamentals of global business*. Litibero publishing.

Jaržemskis, A. (2007). Research on public logistics center as a tool for cooperation. Transport, 22(1).

Li, X., & Chen, Z. (2022). Mechanical behavior and performance optimization of photopolymer composites in stereolithography 3D printing. *Journal of Manufacturing Processes*, 75, 611–624. https://doi.org/10.1016/j.jmapro.2022.02.013

MatWeb. (n.d.). *Overview of Materials*. matweb.com. https://www.matweb.com/search/DataSheet.aspx?MatGUID=29340c5df4bf4de0a511419ce86db27b&ckck=1

Minitab, Inc. (2019). *Minitab* (version 19.0). Minitab, Inc.

Sampieri, R. H., Collado, C. F., & Lucio, P. B. (2014). *Research methodology*. McGraw-Hill.

Sapio Research. (2023, July). *Value of reliability*. ABB survey report https://new.abb.com/docs/librariesprovider19/default-document-library/abb_survey-report-2023.pdf

Tuck, C., Hague, R., & Reeves, P. (2023). The role of additive manufacturing in supply chain resilience and flexibility. *International Journal of Production Research, 61*(7), 2143–2158. https://doi.org/10.1080/00207543.2023.2175283

Zhang, Y., Xu, X., & Luo, Z. (2024). Advances in composite resin formulations for stereolithography-based 3D printing. *Additive Manufacturing Letters*, (8), 101-132. https://doi.org/10.1016/j.addlet.2024.101132

Zhao, J., Li, P., & Wu, D. (2023). Optimization of stereolithography printing parameters using machine learning and mechanical testing correlation. *Rapid Prototyping Journal, 29*(2), 285–298. https://doi.org/10.1108/RPJ-08-2022-0192

COLLABORATIVE WORK TABLE

Role	Author(s)
Conceptualization	Aldape Rivera, Lydia, Rubio Salazar, Raúl,
Methodology	Rubio Salazar, Raúl, Campos Oyervides Josué De Jesús

Software	Minitab, SolidWorks,
Validation	Aldape Rivera, Lydia, Pineda Rosales Diego De Jesús, Salcido Celada Mara Dennise
Formal Analysis	Aldape Rivera, Lydia, Pineda Rosales Diego De Jesus, Salcido Celada Mara Dennise
Research	Rubio Salazar, Raúl
Resources	Rubio Salazar, Raúl, Campos Oyervides Josué De Jesús
Data curation	Rubio Salazar, Raúl, Campos Oyervides Josué De Jesús
Preparation of the draft original	Aldape Rivera, Lydia,
Writing - Revision and editing	Aldape Rivera, Lydia, Rubio Salazar, Raúl, Pineda Rosales Diego De Jesús, Salcido Celada Mara Dennise
Visualization	Rubio Salazar, Raúl, Aldape Rivera, Lydia, Pineda Rosales Diego De Jesús, Salcido Celada Mara Dennise
Supervision	Aldape Rivera, Lydia, Pineda
Project Management	Aldape Rivera, Lydia, Rubio Salazar, Raúl
Fundraising	Rubio Salazar, Raúl, Campos Oyervides Josué De Jesús