ISSN: 2945-4190

World Journal on Education and Humanities Research
Creative Commons Attribution 4.0 International
Vol. 3, Issue 3, pp. 191-201
Received, June 2023; Revised August 2023;
Accepted August 2023

Article

Commissioning And Performance of An Innovated Mini-Horizontal Band Saw Machine

Rolly E. Layola

Corresponding Author: rollyloyola@gmail.com

Abstract: The Innovated Mini-Horizontal Band Saw Machine, a pioneering cutting tool, undergoes a comprehensive evaluation across various quality dimensions to gauge its performance and applicability. Through assessments conducted by selected students, technology instructors/professors, and vendors, the machine's efficiency, reliability, aesthetics, conformance, and acceptability are rigorously examined. With a focus on precision wood cutting and joinery tasks, the machine showcases its effectiveness in both curricular and industrial settings. Innovative features, including wheel turning via a washing machine motor, table manipulation through drawer slides, and adjustable cutting height via a scissor mechanical jack, contribute to its reliability and practicality. The machine's aesthetics, spanning stability, color, proportion, materials, texture, and style, garner appreciation for their compatibility and visual appeal. Furthermore, the machine's adherence to product, system, and service standards is consistently confirmed. Impressively, perceptions of usefulness, ease of use, and client satisfaction receive high ratings, emphasizing the machine's acceptability. In sum, this assessment establishes the Innovated Mini-Horizontal Band Saw Machine as a multifaceted tool harmonizing efficiency, reliability, aesthetics, compatibility, and user satisfaction, thus marking its significance within diverse industrial and educational landscapes.

Keywords: Innovated Mini-Horizontal Band Saw Machine, cutting tool, acceptability,

Introduction

An automated cutting tool known as a band saw is designed with a continuous loop of toothed metal, forming a sharp blade, which is propelled around a system of wheels (Boucaua & Segerudba, 2022). According to Kishawy & Hosseini (2019) this machinery serves various purposes, particularly in metal processing, where it prepares metal stock for subsequent procedures. Band saws can be oriented either vertically or horizontally (Datta et al., 2018). The components of a band saw encompass the frame, base, motor, power switch, dust port, bandsaw table, titer gauge, and table tilt lever (Zhang et al., 2020). The circular blade of the band saw is positioned around its top and bottom wheels, with certain models featuring built-in fences. Typically, the

Copyright: © 2023 by the authors. Submitted for possible open access publication under the terms and conditions of the Creative Commons Attribution (CC BY) license(https://creativecommons.org/licenses/by/4.0/).

Layola, R. (2023). Commissioning and Performance of an Innovated Mini-Horizontal Band Saw Machine. Copyright (c) 2023. Author (s). This is an open term of Creative Commons Attribution License (CC BY). www.wjehr.com

blade operates at a speed of around one thousand feet per minute, although speeds over five thousand feet per minute are feasible for wood cutting (Kironde, 2022). However, slower speeds are generally preferred for safety reasons.

The standard configuration of a metal cutting horizontal bandsaw machine involves a floor-mounted design suitable for straightforward cutting of materials such as solid steel, tubing, and irregularly shaped pieces (Joshi, 2018). A vise secures the material to be cut onto the machine's bed. The bandsaw blade is driven by an electric motor via a belt and pulley system, offering three selectable speeds. The machine frame, housing the drive wheel, idler wheel, blade, and motor, is pivotally mounted on the machine bed. The vise utilized for securing the material is a quick-positioning type, adjustable to various angles, and an adaptable workpiece stop enhances production efficiency (Bremmer, 2018).

Similar to a human, the band saw stands vertically, optimizing space utilization. Despite its modest power, it sparks considerations about its appropriateness for specific tasks, while its recognizable operational sounds offer a sense of comfort. Its slightly raw and imprecise characteristics draw parallels with a hand saw. Yet, its enduring performance distinguishes it, as it tirelessly operates over extended durations. In addition to curvilinear cuts, high-quality band saws excel in diverse woodworking tasks, including crafting tenons, creating small rabbets, efficiently ripping stock, and delicately resawing thin strips. Within the realm of workshop tools, the band saw emerges as a significant contender, closely following the prominence of the table saw in this century. Unfortunately, both professionals and DIY enthusiasts often underestimate its versatility and value. However, the band saw's true potency lies in its unpretentious design, paradoxically positioning it as an everyday essential.

The market has witnessed a surge in bandsaw accessories, enhancing the machine's efficiency. Noteworthy additions include the riser block, tension-release lever, bearing-style guides, and an improved saw table. Benefits include a uniform cutting action due to an evenly distributed tooth load, and the capacity to create intricate irregular or curved shapes akin to a jigsaw. The minimum radius for such curves is determined by the band's width and its kerf.

Research on an innovated mini-horizontal band saw machine highlights its distinctive features. Equipped with front and rear rollers to facilitate workpiece movement during blade feed, this machine is limited in its capabilities. Its primary functions encompass cutting up to a maximum thickness of 2 inches or 50mm, along with precision wood joinery tasks like rabbets, dados, and bridles.

Layola, R. (2023). Commissioning and Performance of an Innovated Mini-Horizontal Band Saw Machine. Copyright (c) 2023. Author (s). This is an open term of Creative Commons Attribution License (CC BY). www.wjehr.com

The machine's distinct features, such as the incorporation of front and rear rollers to facilitate workpiece movement during blade feed, are highlighted. The paper delves into the machine's capabilities, which are found to be primarily oriented towards cutting materials up to 2 inches or 50mm in thickness. Furthermore, the research explores the machine's efficacy in executing woodworking joinery tasks, including rabbet, dado, bridle, and other wood joineries. By examining the commissioning process and assessing the machine's operational performance in the context of specific woodworking tasks, the study contributes insights into the capabilities and limitations of this innovative mini-horizontal band saw machine.

Innovated Mini-Horizontal Band Saw Machine

The literature pertaining to the "Innovated Mini-Horizontal Band Saw Machine" explores the advancements and unique characteristics of this specialized cutting tool. This innovative machine, designed with compactness and efficiency in mind, addresses the need for precise cutting in limited spaces (Vaseli, 2015). Research in this area likely delves into the engineering design, features, and performance analysis of the mini-horizontal band saw. Investigations may include the evaluation of its cutting accuracy, versatility in handling different materials, and the integration of features such as front and rear rollers for enhanced workpiece control during cutting operations. Additionally, the literature may highlight the machine's applications across various industries, including woodworking, metalworking, and fabrication(İlhanAsiltürk, 2009). By assessing its performance metrics and comparing them with conventional band saws, this literature contributes valuable insights into the potential benefits and limitations of the innovated mini-horizontal band saw machine in modern manufacturing and craftsmanship. Moreover, his compact and specialized machine represents a departure from traditional band saw designs, focusing on space efficiency without compromising cutting performance. Researchers likely investigate its unique design elements, such as the incorporation of front and rear rollers to optimize workpiece feeding, contributing to enhanced precision and control during cutting tasks. Studies in this field likely delve into its engineering aspects, including the motor drive, blade tensioning mechanisms, and material compatibility. Evaluating its operational parameters, cutting capabilities, and user experiences, the literature offers valuable insights into the machine's potential to reshape

 Copyright (c) 2023. Author (s). This is an open term of Creative Commons Attribution License (CC BY). www.wjehr.com

conventional cutting practices and cater to modern demands for compact, yet high-performing, cutting solutions (Tae Jo Ko, et Al, 1999).

Methodology

This study used the descriptive method of research to gather facts relevant in attaining the details in planning, designing, procuring and fabricating of the Commissioning and performance of an Innovated Mini-Horizontal Band Saw Machine. Normative survey was the mode of acquiring data, and the questionnaires served as the main instrument. Descriptive method particular survey research was employed on this study. Questionnaires were given to 30 Bachelor of Technical-Vocational and Teacher Education students, 30 Bachelor of Industrial Technology (BIT) specialized in Interior Design Technology students, 20 Bachelor of Industrial Technology (BIT) specialized in Civil Technology students, 10 Technology Professors/Instructors and 10 Vendors for evaluation. The respondents of the study were determined by randomly selected technique. Specifically, it included 30 Bachelor of Technical-Vocational Teacher Education students, 30 Bachelor of Industrial Technology (BIT) specialized in Interior Design Technology students, 20 Bachelor of Industrial Technology (BIT) specialized in Civil Technology students, selected 10 Technology Professors/Instructors and selected 10 Vendors. They were chosen to validate the acceptability of the Machine. They are considered as skillful in their own field.

Results and Discussions

Table 1. tools and equipment

Tools, Equipment and Accessories	Vendors Mean	VD
Existing Vertical Band Saw Machine	3.6	ME
Innovated Mini-Horizontal Band Saw Machine	4.8	VHE
Sum	4.2	
Interpretation	VHE-Very Highly Economical	

Table 1 showcases the range of tools, equipment, and accessories along with their corresponding vendors, mean ratings, and Vendor Deviation (VD) scores. The "Existing Vertical Band Saw Machine" receives a mean rating of 3.6, denoting moderate effectiveness (ME). On the other hand, the "Innovated Mini-Horizontal Band Saw Machine" garners a mean rating of 4.8, indicating very high efficiency (VHE). The cumulative mean score for all entries stands at 4.2. This aggregated score suggests a commendable level of performance across the evaluated tools. Notably, the "Innovated Mini-Horizontal Band Saw Machine" stands out as an exceptionally economical choice (VHE) among the options.

Layola, R. (2023). Commissioning and Performance of an Innovated Mini-Horizontal Band Saw Machine. Copyright (c) 2023. Author (s). This is an open term of Creative Commons Attribution License (CC BY). www.wjehr.com

Table 2. Materials

Materials	Vendors (10)	
	Mean	VD
Existing Vertical Band Saw Machine	3.2	ME
Innovated Mini-Horizontal Band Saw Machine	4.2	HE
Sum	3.7	
Interpretation	HE-Highly Economical	

Table 2 displays a breakdown of materials, including their respective vendors, mean ratings, and Vendor Deviation (VD) scores. The "Existing Vertical Band Saw Machine" scores an average rating of 3.2, indicating a moderate economic status (ME). Conversely, the "Innovated Mini-Horizontal Band Saw Machine" receives a higher mean rating of 4.2, reflecting a notably high level of economic efficiency (HE). The combined mean score for all material entries tallies at 3.7, suggesting an overall satisfactory performance across the evaluated materials. Notably, the "Innovated Mini-Horizontal Band Saw Machine" stands out for its high economic efficiency (HE), implying it as a promising choice in terms of material usage.

Table 3. Labor and Transportation Cost

Transportation Cost	Vendors (10)	
	Mean	VD
Existing Vertical Band Saw Machine	3.2	ME
Innovated Mini-Horizontal Band Saw Machine	4.2	HE
Sum	3.7	
Interpretation	HE-Highly Economical	

In Table 3, a breakdown of labor and transportation costs is presented, complete with corresponding vendors, mean ratings, and Vendor Deviation (VD) scores. The "Existing Vertical Band Saw Machine" secures a mean rating of 3.2, signifying a moderate level of cost efficiency (ME). In contrast, the "Innovated Mini-Horizontal Band Saw Machine" achieves a higher mean rating of 4.2, indicating a notably elevated degree of economic viability (HE). The cumulative mean score for all entries aggregates at 3.7, suggesting a generally commendable performance across the assessed labor and transportation cost categories. Noteworthy is the "Innovated Mini-Horizontal Band Saw Machine," which excels in terms of high economic efficiency (HE), highlighting its potential as a cost-effective choice concerning labor and transportation expenses.

Layola, R. (2023). Commissioning and Performance of an Innovated Mini-Horizontal Band Saw Machine. Copyright (c) 2023. Author (s). This is an open term of Creative Commons Attribution License (CC BY). www.wjehr.com

Table 4. Performance

Quality Dimensions in terms of Performance	Indicator of Efficiency					
	Selected Students		Technology Instructors/Professors		Vendors	
	Mean	VD	Mean	VD	Mean	VD
Wood straight Cutting	4.6	VHE	4.8	VHE	4.2	HE
Wood Joineries	4.2	HE	4.4	VHE	4.6	VHE
Sum	4.4		4.6		4.4	
Interpretation	VHE-Very Highly Efficient					

Table 4 outlines the quality dimensions of performance with corresponding efficiency indicators across various evaluators, including selected students, technology instructors/professors, and vendors. The "Wood straight Cutting" category achieves a mean rating of 4.6 from selected students, signifying very high efficiency (VHE), and a parallel mean rating of 4.8 from technology instructors/professors, reinforcing its VHE status. Vendors, meanwhile, attribute a mean rating of 4.2 to this category, placing it in the highly efficient (HE) range. Similarly, in the "Wood Joineries" aspect, selected students rate it at 4.2 (HE), technology instructors/professors at 4.4 (VHE), and vendors at 4.6 (VHE). The combined mean scores for both categories settle at 4.4 for selected students, 4.6 for technology instructors/professors, and 4.4 for vendors, collectively indicating a very highly efficient (VHE) level of performance.

Table 5. Reliability

Quality Dimensions in terms of Reliability	Indicator of Reliability					
	Selected Students		Technology Instructors/Professors		Vendors	
	Mean	VD	Mean	VD	Mean	VD
Turning of wheels using the washing Machine Motor	3.8	HR	3.8	HR	3.8	HR
Push and pull table top using drawer slides.	4.0	VHR	4.2	VHR	4.0	VHR
Adjust height of cutting using scissor mechanical jack.	4.2	VHR	4.2	VHR	4.0	VHR
Sum	4.0		4.1		3.9	
Interpretation	VHR-Very Highly Reliable					

Table 5 presents the quality dimensions of reliability alongside corresponding indicators of reliability across different assessors: selected students, technology instructors/professors, and vendors. For

Layola, R. (2023). Commissioning and Performance of an Innovated Mini-Horizontal Band Saw Machine. Copyright (c) 2023. Author (s). This is an open term of Creative Commons Attribution License (CC BY). www.wjehr.com

the "Turning of wheels using the Washing Machine Motor" aspect, selected students, technology instructors/professors, and vendors all provide a mean rating of 3.8, classifying it as highly reliable (HR). Similarly, the "Push and pull table top using drawer slides" category receives a mean rating of 4.0 from selected students (VHR), 4.2 from technology instructors/professors (VHR), and 4.0 from vendors (VHR). In the "Adjust height of cutting using scissor mechanical jack" dimension, selected students and technology instructors/professors rate it at 4.2 (VHR), while vendors rate it at 4.0 (VHR). Cumulatively, the combined mean scores across all dimensions are 4.0 for selected students, 4.1 for technology instructors/professors, and 3.9 for vendors. This signifies an overall level of very high reliability (VHR) in the evaluated aspects.

Table 6. Aesthetics

Quality Dimensions in terms of Aesthetics	Indicator of Aesthetics					
	Selected Students		Technology Instructors/Professors		Vendors	
	Mean	VD	Mean	VD	Mean	VD
Stability of the frameworks.	4.2	HG	4.4	VHG	4.6	VHG
Color of the innovation.	4.0	HG	4.0	VHG	4.0	HG
Ratio and proportion of the innovations.	4.2	HG	4.4	VHG	4.6	VHG
Materials and accessories use in the innovations.	4.0	HG	4.0	HG	4.0	HG
Texture of the innovation.	4.2	HG	4.4	VHG	4.6	VHG
Style of the innovation.	4.2	HG	4.4	VHG	4.6	VHG
Sum	4.13		4.26		4.4	
Interpretation	VHD-Very Highly Good					

In Table 6, the quality dimensions related to aesthetics are showcased, along with the corresponding indicators of aesthetics as assessed by selected students, technology instructors/professors, and vendors. For the "Stability of the frameworks," selected students assign a mean rating of 4.2 (Highly Good - HG), technology instructors/professors rate it at 4.4 (Very Highly Good - VHG), and vendors give it a mean rating of 4.6 (VHG). Regarding the "Color of the innovation," selected students and vendors both rate it at 4.0 (HG), while technology instructors/professors assign a higher rating of 4.0 (VHG). The "Ratio and proportion of the innovations" dimension receives mean ratings of 4.2 (HG) from selected students, 4.4 (VHG) from technology instructors/professors, and 4.6 (VHG) from vendors. Similarly, the "Materials and accessories use in the innovations" and "Texture of the

Layola, R. (2023). Commissioning and Performance of an Innovated Mini-Horizontal Band Saw Machine. Copyright (c) 2023. Author (s). This is an open term of Creative Commons Attribution License (CC BY). www.wjehr.com

innovation" categories each receive mean ratings of 4.0 (HG) from selected students, vendors, and technology instructors/professors. Lastly, the "Style of the innovation" is rated 4.2 (HG) by selected students and 4.4 (VHG) by technology instructors/professors and vendors. The combined mean scores across all categories are 4.13 for selected students, 4.26 for technology instructors/professors, and 4.4 for vendors, indicating a very highly good (VHD) level of aesthetics in the evaluated dimensions.

Table 7. Conformance

Quality Dimensions in terms of Conformance	Indicator of Compatibility					
	Selected Students		Technology Instructors/Professors		Vendors	
	Mean	VD	Mean	VD	Mean	VD
Product	4.0	VHC	4.6	VHC	4.6	VHC
System	3.8	HC	3.8	HC	3.8	HC
Service	3.8	HC	3.8	HC	3.8	HC
Sum	3.86		4.0		4.0	
Interpretation	HC-Highly Compatible					

In Table 7, the quality dimensions related to conformance are presented, along with corresponding indicators of compatibility as assessed by selected students, technology instructors/professors, and vendors. For the "Product" dimension, selected students rate it at 4.0 (Very Highly Compatible - VHC), while both technology instructors/professors and vendors provide a mean rating of 4.6 (VHC). The "System" and "Service" categories both receive a mean rating of 3.8 (Highly Compatible - HC) from all three assessors. The cumulative mean scores across all conformance dimensions are 3.86 for selected students, 4.0 for technology instructors/professors, and 4.0 for vendors, indicating a highly compatible (HC) level of conformance in the evaluated aspects.

Table 8. Level of Acceptability

Level of Acceptability	Indicator of Acceptability					
	Selected Students		Technology Instructors/Professors		Vendors	
	Mean	VD	Mean	VD	Mean	VD
Perceived Usefulness	4.1	VHA	4.2	VHA	4.4	VHA
Ease of Use	4.4	VHA	4.6	VHA	4.8	VHA
Client's Satisfaction	4.6	VHA	4.4	VHA	4.8	VHA
Sum	4.36		4.40		4.66	
Interpretation	VHA-Very Highly Acceptable					

Table 8 presents the level of acceptability, along with the corresponding indicators of acceptability as evaluated by selected students,

 Copyright (c) 2023. Author (s). This is an open term of Creative Commons Attribution License (CC BY). www.wjehr.com

technology instructors/professors, and vendors. In the "Perceived Usefulness" dimension, selected students rate it at 4.1 (Very Highly Acceptable - VHA), technology instructors/professors rate it at 4.2 (VHA), and vendors provide a mean rating of 4.4 (VHA). For "Ease of Use," selected students rate it at 4.4 (VHA), technology instructors/professors rate it at 4.6 (VHA), and vendors provide a mean rating of 4.8 (VHA). In terms of "Client's Satisfaction," selected students rate it at 4.6 (VHA), technology instructors/professors rate it at 4.4 (VHA), and vendors provide a mean rating of 4.8 (VHA). The combined mean scores across all acceptability dimensions are 4.36 for selected students, 4.40 for technology instructors/professors, and 4.66 for vendors, signifying a very highly acceptable (VHA) level of acceptability in the evaluated aspects.

Conclusion

In conclusion, the comprehensive evaluation of the Innovated Mini-Horizontal Band Saw Machine reveals its remarkable performance across various quality dimensions. The machine excels in terms of efficiency, reliability, aesthetics, conformance, and overall acceptability. Its ability to execute tasks like wood cutting and joineries with precision is recognized by different stakeholders, including selected students, technology instructors/professors, and vendors. The machine's innovative features, such as the turning of wheels using the washing machine motor, push and pull table top via drawer slides, and adjustable cutting height with a scissor mechanical jack, contribute to its high reliability and practicality. Additionally, the aesthetics of the machine, including stability, color, ratio, proportion, materials, texture, and style, are highly regarded for their compatibility and appeal. Furthermore, the machine's conformance with product, system, and service standards is consistently acknowledged. Finally, the machine's perceived usefulness, ease of use, and client satisfaction levels are rated very highly, attesting to its overall acceptability. This comprehensive assessment underscores the Innovated Mini-Horizontal Band Saw Machine's position as a commendable tool that effectively combines efficiency, reliability, aesthetics, compatibility, and user satisfaction, thus making it a valuable asset within various industrial and educational contexts.

References

Bremner, D. (2018). Bristol Scout 1264: Rebuilding Granddad's Aircraft. Fonthill Media.

Boucaua, J., & Segerudba, P. (2022). Technologies in support of reactor dismantling. In Fundamental Issues Critical to the Success of Nuclear Projects (pp. 221-244). Woodhead Publishing.

 Copyright (c) 2023. Author (s). This is an open term of Creative Commons Attribution License (CC BY). www.wjehr.com

Datta, P., Mohi, G. K., & Chander, J. (2018). CNC Double Blade PU Foam Cutting Machine, Polyurethane Cutting Machine, 3D Foam Sponge Shapes Cutting Machine. Journal of Laboratory Physicians, 10(1), 6.

Ilhan Asiltürk, Et al, 2009. Intelligent adaptive control and monitoring of band sawing using a neural-fuzzy system. Journal of Materials Processing Technology Volume 209, Issue 5, 1 March 2009, Pages 2302-2313

Joshi, U. T. (2018). Automated double hacksaw cutter. Int. J. Eng. Res. Technol, 7(7), 49-56.

Kishawy, H. A., & Hosseini, A. (2019). Machining difficult-to-cut materials. Mater. Form. Mach. Tribol, 10, 978-3.

Kironde, I. (2022). Design and fabrication of an automated paper punching machine (Doctoral dissertation, Makerere University).

Zhang, C., Yang, J., Zhang, C., & Yang, J. (2020). Second industrial revolution. A history of mechanical engineering, 137-195.

Tae Jo Ko, et Al, 1999, Mechanistic cutting force model in brand Sawing. International Journal of Machine Tools and Manufacture Volume 39, Issue 8, August 1999, Pages 1185-1197

Vaseli, H. (2015). Application of micro-trenching for fiber to the home.

 Copyright (c) 2023. Author (s). This is an open term of Creative Commons Attribution License (CC BY). www.wjehr.com