International Journal of Advance Engineering and Technology
Volume 1 Nomor 1 May 2025
e-ISSN: 3089-767X; p-ISSN:3089-8439, Hal 42-50
DOI: https://doi.org/10.63956/ijaetech.v1i1.11
Available online at: https://ijaetech.org/index.php/ijaetech/article/view/11

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Manufacturing Process Development of Adjuster Conveyor Components from SUS 201 for the Take Maker Grinding Conveyor

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Abstract *~ The continuous and large-scale transfer of materials in industrial processes is challenging if solely relying on human labor. Therefore, the use of transport machines such as conveyors is essential to support production efficiency. This study focuses on the development of a conveyor system, particularly the conveyor adjuster component used to regulate the slope at the base. The conveyor adjuster is made from SUS 201 steel, a type of steel with 0.15% carbon content, and is formed into various shapes. The manufacturing processes involved include milling to form the surface and set dimensions, turning to shape cylindrical surfaces and threads, welding to join components, CNC machining for mass production and time efficiency, followed by assembly and quality control stages. Machining calculations for the milling process yielded a cutting speed of 478 rpm, a feed rate of 9.56 mm/min, and a feeding time of 2.4 minutes. These results indicate optimized parameters for efficient production.*
Purpose*~ This research aims to design and manufacture a conveyor adjuster to support the efficient and consistent transfer of workpieces in a grinding machine system.*
Design/methodology/approach*~ The study applies a sequence of manufacturing techniques including milling, turning, welding, CNC machining, and assembly. The approach also includes quality control and machining parameter calculations for the milling process.*
Findings*~ The research found that the optimal machining parameters for the milling process were a cutting speed of 478 rpm, a feed rate of 9.56 mm/min, and a feeding time of 2.4 minutes, which are suitable for mass production.*
Originality/value/Novelty*~ This study presents a practical contribution to improving production line efficiency through the design of a custom conveyor adjuster using SUS 201 steel, integrating conventional and CNC machining processes for optimized output.*
Keywords*~ Adjuster Conveyor, Material SUS 201, Take Maker Gerinding Conveyor*

INTRODUCTION

In modern industrial systems, the movement of products or materials can be facilitated either by human labor or mechanical power. However, for transporting heavy or hazardous materials, mechanical solutions are far more efficient and safer. One of the most effective devices for facilitating the transfer of materials in production processes is the conveyor system (Djamolov, 2020). The term conveyor originates from the word convoy, which means moving together in large numbers. Conveyors can transport large volumes of goods over considerable distances, making them an essential component in many industrial sectors to reduce human workload and increase productivity.

Various types of conveyors are used depending on the characteristics of the materials being handled (Skryabin, 2021). These include apron, flight, pivot, overhead, load propelling, car, bucket, screw, roller, vibrating, pneumatic, and hydraulic conveyors

Received: June 16, 2025; Accepted: July 01, 2025; Available Online: July 02, 2025
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(Hakami et al., 2017). This study focuses on a specific type of roller conveyor machine known as the Take Maker Grinding Conveyor, which is used to support grinding machine operations in industrial environments.

The Take Maker Grinding Conveyor utilizes a pneumatic system to drive the Plate Lifter (Nylon Layer). The working principle involves placing a workpiece on the base, which then moves toward the plate lifter (Hakami et al., 2017; Kawalec et al., 2020). Once it reaches the lifter, the pneumatic system pushes the plate upward, facilitating further processing.

A crucial component in this system is the Adjuster Conveyor, which serves as a slope adjuster at the base, ensuring the workpiece moves according to the desired direction (Hakami et al., 2017; Skryabin, 2021). The Adjuster Conveyor is composed of several interconnected parts such as the Hinge Lifter, Plate Joint, Hinge Pin, and Lifter Guide Shaft. Positioned below the base and connected to the frame, the Adjuster Conveyor maintains a fixed and stable configuration.

Selection of the conveyor system and its components depends on factors such as load capacity, travel distance, height, material characteristics, equipment cost, and the intended processing steps. In this study, SUS 201 stainless steel is selected as the material for the Adjuster Conveyor due to its 10.5% chromium content, providing strong resistance to corrosion. The fabrication process includes drilling with a milling machine and the use of a HAAS SF-10 CNC Lathe to ensure precision and production efficiency (Wang, Li, & Chen, 2019).

Figure 1. Adjuster Conveyor

Purpose of Writing

The purpose of this writing is as follows:

1. To identify the material used in the manufacturing process of the Adjuster Conveyor, specifically SUS 201 stainless steel.

2. To describe the step-by-step production process involved in manufacturing the Adjuster Conveyor.
3. To present the machining process calculations relevant to the fabrication of the Adjuster Conveyor.

Limitations of the Problem

The material used in the manufacturing process of the Adjuster Conveyor is SUS 201 stainless steel.

1. The material used in the manufacturing process of the Adjuster Conveyor is SUS 201 stainless steel.
2. The discussion is limited to the manufacturing processes specific to the Adjuster Conveyor.
3. Only the machining calculations related to the production of the Adjuster Conveyor are considered.

METHODS

This flow chart is used to simplify the manufacturing process. Adjuster Conveyor. The flow diagram of the manufacturing process adjuster conveyor as follows:

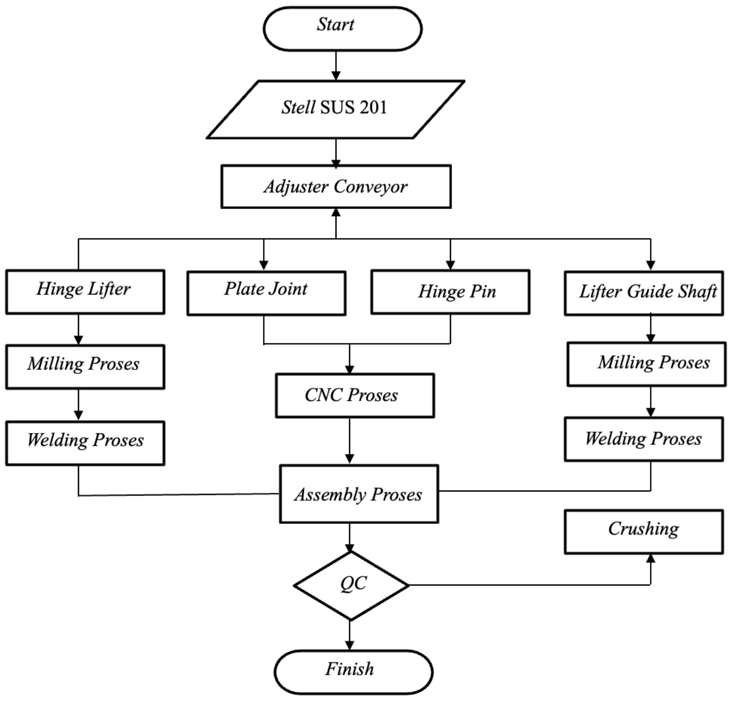

Figure 1. Flow Diagram

e-ISSN: 3089-767X; p-ISSN:3089-8439, Hal 42-50

Material Preparation

PT. Sumber Teknik Sukses Sentosa chooses SUS 201 material as the main material for making adjuster conveyor this. In the process of making adjuster conveyor This SUS 201 material is divided into two types, namely: type plate and type round bar.

Component Manufacturing Process Adjuster Conveyor

As for the components Adjuster Conveyor which will be produced at PT. Sumber Teknik Sukses Sentosa using various types of production machines, both conventional and non-conventional, as follows:

Creation Hinge Lifter

In this initial process, it is the manufacturing process hinge lifter. Hanger lifter is one part of adjuster conveyor which functions as a top stand that is integrated with the base conveyor, Hinge Lifter This uses SUS 201 type steel material plate.

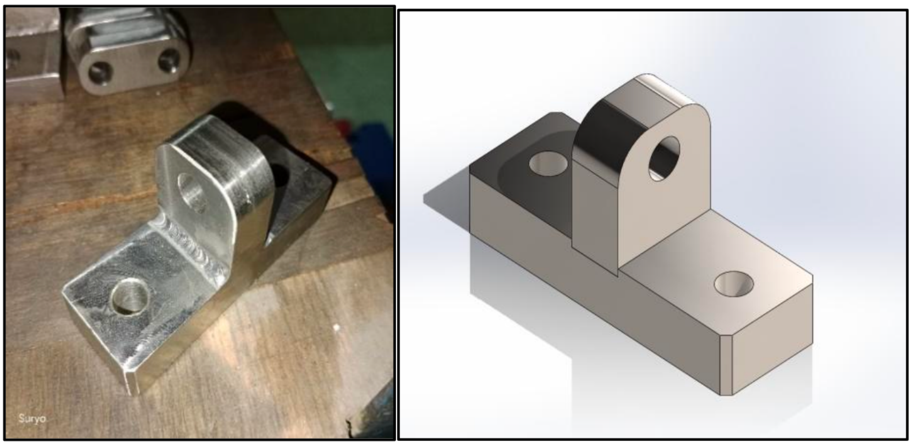

Figure 3. Manufacturing Process *Hinge Lifter*

Creation Plate Joint

In the manufacturing process plate joint the material used remains the same, namely SUS 201 type steel plate, plate joint here serves as a connector between hinge lifter with lifter guide shaft later. The process carried out to make plate joint At PT. Sumber Teknik Sukses Sentosa, this is the CNC process milling by using the machine CNC Machining Center HAAS VF-3.

Figure 4. Result of Making *Plate Joint*

Creation Hinge Pin

Process of work hinge pin At PT. Sumber Teknik Suskes Sentosa, they use CNC machines Lathe HAAS ST-10 because this machine is a machine with a model turning.

Figure 5. Result of Making *Hinge Pin*

Manufacturing Lifter Guide Shaft

In the manufacturing process lifter guide shaft. The material used is SUS 201 with the type round bar initial dimensions length 170 mm and diameter 22 mm. Manufacturing lifter guide shaft This goes through a two-stage process, namely the first stage of the process turning and the second process milling.

Figure 6. Result of Making Lifter Guide Shaft

Quality Control

Quality is often used as a benchmark and differentiator for a product and service between one manufacturer and another. Quality can be interpreted as the level of good or bad a product produced and whether the product produced is in accordance with the specified specifications or its suitability to needs. The Quality Control standards that must be checked by the operator are in the manufacturing process *adjuster conveyor*.

RESULTS

The manufacturing process of the Adjuster Conveyor at PT. Sumber Teknik Sukses Sentosa involved a series of machining stages combining both conventional and CNC-based methods. The main objective was to fabricate four critical components: Hinge Lifter, Plate Joint, Hinge Pin, and Lifter Guide Shaft—each requiring specific processes and tolerances to meet the functional requirements of the Take Maker Grinding Conveyor system.

Material Selection and Preparation

SUS 201 stainless steel was selected due to its corrosion resistance and mechanical workability. It contains approximately 0.15% carbon, 5.5–7.5% manganese, 1% silicon, 16–18% chromium, and 1.0–2.5% nickel. This composition allows for moderate strength, good ductility, and excellent welding properties—key requirements in dynamic conveyor systems subjected to repeated loading.

Component Manufacturing Analysis

Hinge Lifter

Manufactured using a conventional milling machine and welded to other parts, the Hinge Lifter fabrication process achieved a cutting speed of 597 rpm and a feed rate of 11.94 mm/min. The machining time was approximately 1.4 minutes per piece. This result indicates the effectiveness of using medium-speed parameters for achieving dimensional accuracy in plate components.

Plate Joint

This component was produced using a CNC milling process on a HAAS VF-3 Machining Center. The use of CNC allowed for higher precision and repeatability, essential for maintaining the alignment of assembled parts. The geometrical consistency of the output illustrates the benefit of integrating automation in the component interface design.

Hinge Pin

Utilizing CNC turning with the HAAS ST-10 lathe machine, the hinge pin production benefited from controlled spindle speed and consistent diameter tolerances, which are vital for the rotation and locking mechanisms in the conveyor system.

Lifter Guide Shaft

This cylindrical component underwent both turning and milling processes using SUS 201 round bar (170 mm length, 22 mm diameter). The calculated parameters included a cutting speed of 478 rpm and a feed rate of 9.56 mm/min, with a feeding time of 2.4 minutes. These values represent an optimal balance between speed and surface finish required in guide components.

Process Efficiency and Time Analysis

The machining time for each component ranged from approximately 1.4 to 2.4 minutes, suggesting a favorable production cycle time for batch manufacturing. These results validate the selection of machining parameters and show that the integration of both conventional and CNC machines contributes to production efficiency without compromising quality.

Quality Control and Performance Implication

All components underwent dimensional verification and quality checks to ensure compliance with design tolerances. The consistent performance across fabricated parts demonstrates the suitability of SUS 201 in mechanical assemblies subjected to moderate structural and environmental stress. Additionally, the dual machining approach enabled better adaptation to part complexity and production volume requirements.

Implications for Industrial Practice

This manufacturing approach can serve as a reference for other industries requiring custom conveyor components with moderate complexity. The workflow presented illustrates how process selection and parameter optimization directly affect productivity, cost-efficiency, and component reliability.

CONCLUSION

This study has successfully demonstrated the manufacturing process of the *Adjuster Conveyor* at PT. Sumber Teknik Sukses Sentosa using SUS 201 stainless steel. This material, categorized as low-carbon austenitic steel, contains approximately 0.15% carbon, 5.5–7.5% manganese, 1% silicon, 16–18% chromium, and 1.0–2.5% nickel, offering high wear resistance, good formability, and weldability—making it suitable for industrial mechanical components.

The production of the Adjuster Conveyor comprises four key components: Hinge Lifter, Plate Joint, Hinge Pin, and Lifter Guide Shaft—each manufactured through a combination of conventional (turning and milling) and non-conventional (CNC turning and CNC milling) machining processes. For instance, the Hinge Lifter is produced using a milling process and joined via welding, while Plate Joint and Hinge Pin are fabricated using CNC milling and CNC turning, respectively.

Machining performance was evaluated through process parameter calculations. For Hinge Lifter Part A, the cutting speed was 597 rpm with a feed rate of 11.94 mm/min, requiring approximately 1.4 minutes of feeding time. Hinge Lifter Part B operated at 478 rpm and 9.56 mm/min, taking about 1.8 minutes. Similarly, the Lifter Guide Shaft process involved a cutting speed of 478 rpm, feed rate of 9.56 mm/min, and a feeding time of approximately 2.4 minutes. These results affirm the efficiency of the selected machining strategies and material suitability for precise component fabrication.

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