

FABRICATION OF BLADE SYSTEM STIRRER SETUP FOR STIR CASTING

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ABSTRACT

The blade system stirrer setup is an important component of the stir casting machine, which is used for the fabrication of metal matrix composites. This setup is used to stir the molten metal and the reinforcement material to ensure uniform distribution of the reinforcement particles in the metal matrix. In this work, the fabrication of the blade system stirrer setup for the stir casting machine work is done. The blade system stirrer setup consists of a motor, a shaft, and a set of blades. The motor is used to rotate the shaft, which in turn rotates the blades. The blades are designed to create turbulence in the molten metal and the reinforcement material, which helps in achieving a uniform distribution of the reinforcement particles.

INTRODUCTION

Stir casting is one of the prominent and economical technique for development and processing of metal matrix composites (MMC's) materials. Composite material properties has increased strength, high elastic modulus, and higher service temperature, improved wear resistance, decreased part weight, lower thermal shocks, higher electrical and thermal conductivity, and lower coefficient of thermal expansion compound compared to conventional metals and alloys. The excellent mechanical properties of these materials and the relatively low producing cost make them very attractive for a variety of applications in automotive and aerospace industries.

In this work the ultimate tensile strength, stiffness, hardness and yield strength, of the composite becomes poor because the ceramic materials have different density, melting point and boiling point. However, other light materials like Aluminum, copper, magnesium etc. have less density, melting point and boiling point, so ceramic particle mixing is very difficult in light materials.

Our objective of this work is to improve the distribution of reinforcement with base material which can improve the chemical and mechanical properties. This work deals with the introduction to composite materials, types of composite and stir casting method for designing the stir.

The Objective is to design and fabricate composite blade using stir casting machine setup in a cheapest way.

Importance of work :

Stir casting process is mainly used to produce automotive and aerodynamic parts. By using aluminium as base material with other reinforcements need best quality of the product for

automotive and airplane parts. These composites are required to full fill all the required properties like strength, hardness, ultimate tensile strength, yield strength etc. of the parts. From design point of view stir design is important because to get best properties of composite material it is necessary to distribute molten metal uniformly. To perform uniform distribution of molten metals, impeller is made up of graphite with helical gear cutting. To eliminate use of nut and bolt to fix stir rod and graphite impeller internal threads will be used by creating hole on the middle of the graphite impeller.

Components used

- Motor driver
- Timmer
- Stirrer rod
- Stirrer blade
- Metal frame
- Stand
- L-clamp
- Adapter
- Switch
- Cable wires
- Motor Regulator

DC MOTOR :

A DC motor is a type of electrical machine that converts electrical energy into mechanical energy through the interaction between a magnetic field and an electric current. The basic construction of a DC motor includes a stator (stationary part) and a rotor (rotating part). The stator consists of a set of magnets that create a fixed magnetic field, while the rotor consists of a coil of wire (called an armature) that rotates within the magnetic field. when a current flows through the armature, it generates a magnetic field that interacts with the stator's magnetic field, causing the rotor to rotate. The direction of rotation can be controlled by reversing the polarity of the current flowing through the armature.

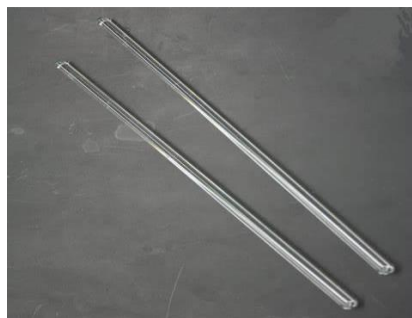
TIMMER :

A stopwatch is a handheld timepiece designed to gauge the span of time which elapses between its activation and deactivation. In manual stopwatch time, the watch is started and stopped by a user pressing a button. However, in fully automatic timing, both starting and stopping are stimulated automatically, by sensors.

STIRRER ROD :

This glass it is less affected by thermal stress and has an expansion point thermal very low, so it is less. Stirring rods are mainly used in science laboratories for chemistry or biology experiments. The stirring rods are important because it agitates a solution, also known as stirring, makes let the reaction happen faster.

The rods are also used to spread liquid substances on a solid surface. Be a metal bar is preferable because glass is not a good conductor of heat and metal is. The metal has free electrons. Therefore, in the metals, conduction takes place due to atomic vibration.



STIRRER BLADE :

A stirrer blade is a tool used to mix or stir substances together. It is typically a flat, paddle-shaped tool that is attached to a motor or a handle, which can be manually rotated to agitate the mixture. Stirrer blades are commonly used in laboratory settings, as well as in various industrial processes such as chemical manufacturing and food processing.

Stirrer blades can come in different shapes and sizes depending on the application, and they can be made from a variety of materials including plastic, metal, or glass. Some blades are designed with different configurations of fins or paddles to optimize mixing efficiency or reduce the chance of creating air pockets in the mixture in Fig 4:



METAL FRAME:

A metal frame refers to a structural support system made primarily of metal, such as steel or aluminum. Metal frames are commonly used in construction, manufacturing, and transportation industries, as they provide strength and durability while also being lightweight. In construction, metal frames can be used to support buildings, bridges, and other structures. They can be used for everything from the framework of a skyscraper to the framing of a small shed. Metal frames are also commonly used in manufacturing to support machinery, conveyors, and other equipment.



Fig 5: METAL FRAME

STAND :

A stand is a supporting structure or platform used to hold an object or device in a stable upright position. Stands can come in many different shapes, sizes, and materials, depending on their intended use.

For example, a microphone stand is used to hold a microphone in place during a performance or recording session. It typically consists of a base, a shaft, and an adjustable arm that can be moved up or down to position the microphone at the desired height and angle.

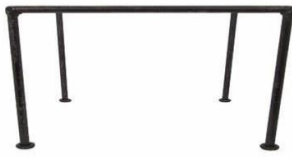


Fig 6 : STAND

L clamps :

L-clamps are a type of clamp that are commonly used in woodworking and metalworking. They consist of two arms that are perpendicular to each other, with one arm being longer than the other. The shorter arm is used to hold the material being clamped in place, while the longer arm provides the clamping force.

Fig 7



Fig 7 : L- CLMAPS

Cables:

Cables play an essential role in transmitting signals and power in a wide range of electronic devices and systems. The quality of cables used in electronic devices can have a significant impact on their overall performance, reliability, and safety. Here are a few key factors to consider when evaluating the importance of cables.

Signal quality: The quality of the cable can directly affect the quality of the signal being transmitted. Poor quality cables can result in signal degradation, noise, interference, and data loss, which can ultimately affect the performance of the electronic device or system.

Power transmission: Cables are also responsible for transmitting power between devices. Poor quality cables can result in power loss, heat build-up, and even fires in extreme cases, which can be dangerous and damaging to the devices and people using them.

Adapter:

Adapters are both important concepts in the field of natural language processing (NLP). A transformer is a type of neural network architecture that was introduced in the paper "Attention Is All You Need" by Vaswani et al. in 2017. Transformers use self-attention mechanisms to process input sequences of variable length and generate output sequences. They have been shown to be highly effective in a wide range of NLP tasks, including language modelling, machine translation, and text classification. On the other hand, adapters are a recent innovation in the field of transfer learning for NLP.

Switch:

Electrical switches are devices that allow you to control the flow of electricity in a circuit. They are used to turn electrical devices on and off, and to control the direction of current flow.

There are many different types of electrical switches,

- Toggle switches - These are simple switches that you flip up or down to turn a device on or off.
- Rocker switches - These switches have a similar function to toggle switches, but they have a rocker mechanism that allows you to turn them on and off with a gentle push.
- Push-button switches - These switches are activated by pressing a button, and they are often used in applications where a momentary connection is needed.
- Rotary switches - These switches are used to select between multiple settings, and they are often used in devices that require multiple modes or settings.
- Slide switches - These switches have a sliding mechanism that allows you to turn them on and off by sliding them back and forth.
- Microswitches - These are small, highly sensitive switches that are often used in control systems to detect changes in pressure or position.



Fig:10 :SWITCH

Motor Regulator:

A motor regulator is an electronic device or circuit that controls the speed and direction of an electric motor. The regulator typically receives signals from a user interface, such as a control knob or a digital keypad, and then adjusts the power delivered to the motor to achieve the desired speed and direction. Motor regulators are commonly used in a variety of applications, including industrial machinery, automotive systems, and consumer electronics. They can be designed to work with different types of motors, such as DC motors, AC motors, and stepper motors.



Fig11: MOTOR REGULATOR

WORKING

Fabricating a blade system stirrer setup for a stir casting machine involves the following steps:

Design the stirrer blade system :

The first step in fabricating a blade system stirrer setup is to design the stirrer blade system. The design should consider the material to be stirred, the viscosity of the material, the size of the stir casting machine, and the desired mixing intensity. The blade system should be designed to maximize the mixing efficiency and minimize any dead zones in the mixing chamber. Select the materials: The materials used for the blade system should be selected based on the properties of the material to be stirred. The blade system should be made of a material that is strong, durable, and corrosion-resistant.

Fabricate the blades :

The blades can be fabricated using a variety of methods such as casting, forging, or machining. The blades should be fabricated to the exact specifications of the design to ensure optimal mixing efficiency.

Fabricate the stirrer shaft :

The stirrer shaft should be fabricated to the exact specifications of the design. The shaft should be made of a material that is strong and durable.

Assemble the blade system:

The blade system should be assembled onto the stirrer shaft, ensuring that the blades are evenly spaced and angled correctly. The blade system should be balanced to ensure smooth operation. Install the blade system on the stir casting machine: The blade system should be installed onto the stir casting machine and connected to the motor. The motor should be capable of providing enough power to rotate the blade system at the desired speed

Test the blade system:

The blade system should be tested to ensure that it is operating correctly and efficiently. The mixing efficiency should be measured And compared to the desired mixing intensity. Make any necessary adjustments: If the mixing efficiency is not at the desired level, adjustments should be made

- The blade system stirrer setup is an important component of the stir casting machine, which is used for the fabrication of metal matrix composites. This setup is used to stir the molten metal and the reinforcement material to ensure uniform distribution of the reinforcement particles in the

metal matrix. In this work, we discussed the fabrication of the blade system stirrer setup for the stir casting machine.

- The blade system stirrer setup consists of a motor, a shaft, and a set of blades. The motor is used to rotate the shaft, which in turn rotates the blades. The blades are designed to create turbulence in the molten metal and the reinforcement material, which helps in achieving a uniform distribution of the reinforcement particles.
- It's important to note that the specific steps for fabricating a blade system stirrer setup can vary depending on the design of the stir casting machine and the requirements of the application. It's always a good idea to consult with a professional or experienced fabricator to ensure that the stirrer setup is designed and fabricated correctly.

MATERIAL SELECTION :

Selecting the right material for the blade system of a stirrer setup for a stir casting machine is crucial for achieving efficient and effective mixing. The material should be strong, durable, and corrosion-resistant to withstand the harsh mixing environment and ensure a long lifespan of the blade system. Here are some materials that are commonly used for blade systems in stir casting machines

Stainless Steel: Stainless steel is a popular choice for blade systems in stir casting machines due to its high strength and corrosion resistance. It is also relatively lightweight and easy to machine, making it ideal for complex blade designs.

Titanium: Titanium is an excellent choice for blade systems due to its high strength-to-weight ratio, corrosion resistance, and biocompatibility. It is commonly used in biomedical applications and in industries where high strength and corrosion resistance are critical.

Aluminum: Aluminum is a lightweight and corrosion-resistant material that is often used in blade systems for stir casting machines. It is relatively inexpensive and easy to machine, making it a popular choice for low- to medium-intensity mixing applications.

Carbon Fiber: Carbon fiber is a lightweight and high-strength material that is often used in high-intensity mixing applications. It is also highly resistant to corrosion, making it ideal for harsh environments. However, it is more expensive than other materials and may require specialized manufacturing techniques.

Ceramic: Ceramic materials are highly resistant to wear and corrosion, making them ideal for use in blade systems for stir casting machines. They are also relatively lightweight and can withstand high temper.

Aluminum: Aluminum is a lightweight and corrosion-resistant material that is often used in blade systems for stir casting machines. It is relatively inexpensive and easy to machine, making it a popular choice for low- to medium-intensity mixing applications.

Carbon Fiber: Carbon fiber is a lightweight and high-strength material that is often used in high-intensity mixing applications. It is also highly resistant to corrosion, making it ideal for harsh environments. However, it is more expensive than other materials and may require specialized manufacturing techniques.

Use of a blade system stirrer setup can help to improve the efficiency, productivity, and quality of the stir casting process, making it a valuable investment for many manufacturing applications. The use of a stirrer can increase the productivity of the casting process by reducing the time required for mixing, reducing the need for manual intervention and Better quality control.

CONCLUSION

The fabrication of a blade system stirrer setup for a stir casting machine is an important process used in various industries, including aerospace, automotive, medical implants, and sports equipment. The use of advanced materials, simulation and modeling, smart sensing and control, additive manufacturing, and automation are some of the future improvements and innovations that could enhance the performance and efficiency of the process. It is considered that the limitations of the fabrication process, such as material limitations, design limitations, cost limitations, safety limitations, and operational limitations. Addressing these limitations is crucial in ensuring the safety and efficiency of the stir casting process and achieving high-quality products. The fabrication of a blade system stirrer setup for a stir casting machine plays a critical role in the production of high-strength and lightweight materials, and ongoing research and development in this area will continue to drive innovation and improve the manufacturing process in the future.

PHOTOGRAPHY



Fig : 1 : WELDING WORK



FIG 2: WELDED THE FRAME



FIG : 3 STRIRRER SET UP

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