Illuminate NEBRASKA
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MATERIALS

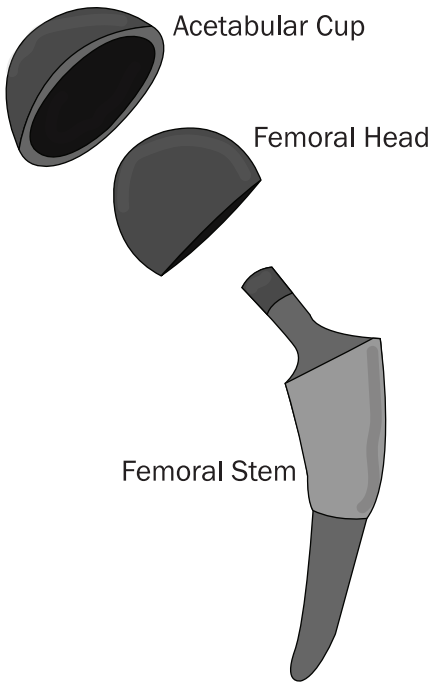
MACHINING

CONCEPT Machining is a process used in manufacturing that involves the removal of material from a workpiece using cutting tools. This process is used to create various shapes and sizes of objects, including intricate parts and components. Machining can be performed using different techniques such as milling, drilling, turning, and grinding. The goal of machining is to produce high-precision parts that meet specific design specifications and tolerances.

BACKGROUND

The history of material machining dates back to ancient times when humans first began using primitive tools to shape and modify materials. The Industrial Revolution in the 18th century marked a significant turning point in the development of machining, with the introduction of machines such as lathes and milling machines. Over the next century, advancements in materials science and engineering led to the creation of new machining techniques and tools, such as the invention of the diamond cutting tool in the 1950s. In recent years, the development of computer-controlled machining systems has further revolutionized the field, allowing for increased precision and efficiency. Today, machining plays a critical role in manufacturing industries such as aerospace, automotive, and medical device production, enabling the creation of complex and precise components that are essential to modern technology.

Metal Hip



Make sure it measures up

EXAMPLES

WORKPIECE: This is the material that is being machined, which can be made of various metals, plastics, or other materials.

CUTTING TOOL: This is the tool that removes material from the workpiece, and it can come in various shapes and sizes depending on the machining technique being used.

MACHINE TOOL: This is the machine that holds and moves the cutting tool and the workpiece, and it can include equipment such as lathes, milling machines, and grinders.

FIXTURE: This is a device that holds the workpiece in place during machining to ensure it remains stable and consistent.

COOLANT: This is a liquid used to cool the workpiece and the cutting tool during machining, which can prevent damage and improve efficiency.

APPLICATION

Medical implants such as hip and knee replacements are often custom-made to fit a patient's unique anatomy. Machining is a critical step in the production of these implants, as it allows for precise shaping and sizing of the implant components to fit the patient's specific needs.

A patient may require a hip replacement that is designed to fit their unique bone structure. A CT scan of the patient's hip is used to create a 3D model of the joint, which is then used to program a CNC machine to precisely shape and cut the implant components from a block of metal such as titanium or cobalt/chromium alloys. Most medical devices require a tight tolerance, usually 0.002 in or less, so precision is key. The machined components are then assembled and finished to create a custom-fit implant that can provide the patient with improved mobility and quality of life.

This application of material machining in the medical field demonstrates the importance of precision and accuracy in machining, as even small deviations from the desired specifications can lead to implant failure or complications for the patient. Machining also allows for customization and personalization of medical implants, which can lead to improved outcomes and quality of life for patients.