

Vocabulary for Engineering



คำศัพท์
ภาษาอังกฤษ

วิศวกรรมเครื่องกล



Jack PK

Preface

Vocabularies for Mechanical engineering

English words that are used to name objects or techniques of use. Words spoken both directly and these theoretical practices will be arranged in this book. By the structure of the content those words will be quoted with an explanation appended. Some items may be used at the same time and complement each other as some words. The author and editor tried to follow the usage and commonly known things in lessons and daily life to get 200 words of Vocabularies for Mechanical engineering

คำศัพท์วิศวกรรมเครื่องกล

คำภาษาอังกฤษที่ใช้เรียกวัตถุหรือเทคนิคการใช้งาน หนังสือเล่มนี้จะรวบรวมคำพูดทั้งโดยตรงและเชิงปฏิบัติเหล่านี้ไว้ ตามโครงสร้างของเนื้อหาคำเหล่านั้นจะยกมาพร้อมคำอธิบายต่อท้าย บางรายการอาจใช้พร้อมกันและเสริมกันเป็นคำบางคำได้ ผู้เขียนและบรรณาธิการพยายามติดตามการใช้และสิ่งรู้ทั่วไปในบทเรียนและชีวิตประจำวัน เพื่อให้ได้คำศัพท์วิศวกรรมเครื่องกล จำนวน **200** คำ

Sample

Mechanical Engineering:

1. Mechanical
2. Force
3. Motion
4. Energy
5. Friction
6. Turbine
7. Gear
8. Lubrication
9. Heat transfer
10. Fluid dynamics
11. Thermodynamics
12. Materials science
13. Machine design
14. Robotics
15. Manufacturing
16. Control systems
17. Vibration analysis
18. Stress analysis
19. Mechatronics
20. Automotive engineering

These words can be used as object names or to describe various techniques and concepts used in the respective fields. The book aims to provide explanations and examples for each word mentioned above, helping aspiring engineers understand and prepare for their future careers.

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10. Deformation
11. Vibration
12. Fatigue
13. Creep
14. Elasticity
15. Plasticity
16. Yield strength

17. Tensile strength
18. Shear strength
19. Resilience
20. Hardness
21. Ductility
22. Brittle
23. Crack propagation
24. Failure analysis
25. Thermal expansion
26. Heat transfer
27. Thermodynamics
28. Fluid mechanics
29. Pressure
30. Flow rate
31. Turbulence
32. Mass flow rate
33. Reynolds number
34. Bernoulli's equation
35. Compressible flow
36. Incompressible flow
37. Pump
38. Compressor

- 39. Fan
- 40. Nozzle
- 41. Valve.
- 42. Piston
- 43. Crankshaft
- 44. Camshaft
- 46. Transmission
- 47. Gear
- 48. Bearing
- 49. Belt drive
- 50. Chain drive

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- 51. Coupling
- 52. Actuator
- 53. Sensor
- 54. Controller
- 55. Automation
- 56. Robotics
- 57. CAD (Computer-Aided Design)
- 58. CAM (Computer-Aided Manufacturing)

- 59. FEA (Finite Element Analysis)
- 60. HVAC (Heating, Ventilation, and Air Conditioning)
- 61. Refrigeration
- 62. Power plant
- 64. Steam turbine
- 65. Gas turbine
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- 125. Piping system

- 126. Pipe fittings
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- 187. Material selection
- 188. Stress analysis
- 189. Strain analysis

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- 192. Beam theory
- 193. Stress concentration
- 194. Shaft design
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- 200. Control valve

Introductions

What is Mechanical engineering?

Mechanical engineering is a branch of engineering that applies principles of physics, materials science, and mathematics to design, analyze, and manufacture mechanical systems. It involves the study of motion, energy, and forces and their application to building and maintaining machines and structures.

Mechanical engineers work in various industries, including automotive, aerospace, energy, manufacturing, and robotics. They play a key role in designing, developing, and maintaining mechanical systems and devices that are used in everyday life, ranging from small components to large-scale machinery.

The role of a mechanical engineer includes:

1. Design and Development: Mechanical engineers are involved in the design and development of mechanical

systems and products. They use computer-aided design (CAD) software to create models, analyze their functionality, and optimize their performance. They consider factors such as strength, durability, reliability, cost-effectiveness, and safety.

2. Analysis and Simulation: Mechanical engineers perform analysis and simulations to evaluate the performance of mechanical systems. They use mathematical models and computer simulations to assess factors like stress, vibration, fluid flow, and heat transfer. This helps in improving the efficiency and functionality of the systems.

3. Manufacturing and Production: Mechanical engineers are responsible for manufacturing and production processes. They work on selecting and designing the appropriate manufacturing methods and processes to ensure efficient production of components and systems. They may also oversee the production process to ensure quality control and adherence to specifications.

4. Testing and Evaluation: Mechanical engineers conduct tests and evaluations on mechanical systems to ensure they meet design specifications and functional requirements. They analyze test data, identify problems or areas for improvement, and make necessary modifications to enhance performance.

5. Maintenance and Repair: Mechanical engineers are involved in the maintenance and repair of mechanical systems and equipment. They develop maintenance schedules, conduct inspections, and troubleshoot issues to ensure optimal performance and longevity of mechanical systems.

6. Research and Innovation: Mechanical engineers contribute to research and development activities to improve existing technologies or develop new ones. They work on innovations in areas such as sustainable energy, robotics, automation, and materials science.

Mechanical engineering requires a strong foundation in mathematics, physics, and engineering principles. It

involves problem-solving skills, creativity, attention to detail, and a thorough understanding of manufacturing processes and materials. Mechanical engineers play a critical role in shaping the design, functionality, and efficiency of mechanical systems and contribute to technological advancements across various industries.

วิศวกรรมเครื่องกลคืออะไร?

วิศวกรรมเครื่องกลเป็นสาขาวิชาวิศวกรรมศาสตร์ที่ใช้หลักการทำงาน ฟิสิกส์ วัสดุศาสตร์ และคณิตศาสตร์ในการออกแบบ วิเคราะห์ และผลิต ระบบเครื่องกล เป็นการศึกษาเกี่ยวกับการเคลื่อนไหว พลังงาน และแรง ตลอดจนการประยุกต์ใช้ในการสร้างและบำรุงรักษาเครื่องจักรและ โครงสร้าง

วิศวกรเครื่องกลทำงานในอุตสาหกรรมต่างๆ รวมถึงยานยนต์ การบิน และอวกาศ พลังงาน การผลิต และหุ้นยนต์ พากษาเมืองท่าทางสำคัญ ใน การออกแบบ พัฒนา และบำรุงรักษาระบบและอุปกรณ์ทางกลที่ใช้ใน ชีวิตประจำวัน ตั้งแต่ส่วนประกอบขนาดเล็กไปจนถึงเครื่องจักรขนาด ใหญ่

บทบาทของวิศวกรเครื่องกลประกอบด้วย:

1. การออกแบบและพัฒนา: วิศวกรเครื่องกลมีส่วนร่วมในการออกแบบและพัฒนาระบบและผลิตภัณฑ์เครื่องกล พากษาใช้ซอฟต์แวร์การออกแบบโดยใช้คอมพิวเตอร์ช่วย (CAD) เพื่อสร้างแบบจำลองวิเคราะห์ฟังก์ชันการทำงาน และเพิ่มประสิทธิภาพการทำงาน โดยคำนึงถึงปัจจัยต่างๆ เช่น ความแข็งแกร่ง ความทนทาน ความน่าเชื่อถือ ความคุ้มค่า และความปลอดภัย
2. การวิเคราะห์และการจำลอง: วิศวกรเครื่องกลทำการวิเคราะห์และจำลองเพื่อประเมินประสิทธิภาพของระบบเครื่องกล พากษาใช้แบบจำลองทางคณิตศาสตร์และการจำลองด้วยคอมพิวเตอร์เพื่อประเมินปัจจัยต่างๆ เช่น ความเครียด การสั่นสะเทือน การไหลของของไหล และการถ่ายเทความร้อน ซึ่งจะช่วยในการปรับปรุงประสิทธิภาพและการทำงานของระบบ
3. การผลิตและการผลิต: วิศวกรเครื่องกลมีหน้าที่รับผิดชอบในการผลิตและกระบวนการผลิต พากษาทำงานในการเลือกและออกแบบวิธีและกระบวนการผลิตที่เหมาะสมเพื่อให้แน่ใจว่าการผลิตส่วนประกอบและระบบมีประสิทธิภาพ พากษาดูแลกระบวนการผลิตเพื่อให้มั่นใจในการควบคุมคุณภาพและการปฏิบัติตามข้อกำหนด
4. การทดสอบและประเมินผล: วิศวกรเครื่องกลดำเนินการทดสอบและประเมินผลระบบเครื่องกลเพื่อให้แน่ใจว่าเป็นไปตามข้อกำหนดการ

ออกแบบและข้อกำหนดด้านการทำงาน พวกเข้าวิเคราะห์ข้อมูลการ
ทดสอบ ระบุปัญหาหรือจุดที่ต้องปรับปรุง และทำการแก้ไขที่จำเป็นเพื่อ²
ปรับปรุงประสิทธิภาพ

5. การบำรุงรักษาและการซ่อมแซม: วิศวกรเครื่องกลมีส่วนร่วมในการ
บำรุงรักษาและซ่อมแซมระบบและอุปกรณ์เครื่องกล พวกเข้าพัฒนา
ตารางการบำรุงรักษา ดำเนินการตรวจสอบ และแก้ไขปัญหาเพื่อให้
มั่นใจถึงประสิทธิภาพสูงสุดและอายุการใช้งานที่ยาวนานของระบบ
กลไก

6. การวิจัยและนวัตกรรม: วิศวกรเครื่องกลมีส่วนร่วมในกิจกรรมการ
วิจัยและพัฒนาเพื่อปรับปรุงเทคโนโลยีที่มืออยู่หรือพัฒนาเทคโนโลยี
ใหม่ พวกเข้าทำงานเกี่ยวกับนวัตกรรมในด้านต่างๆ เช่น พลังงานที่
ยั่งยืน หุ่นยนต์ ระบบอัตโนมัติ และวัสดุศาสตร์

วิศวกรรมเครื่องกลจำเป็นต้องมีรากฐานที่แข็งแกร่งในด้านคณิต
ศาสตร์ ฟิสิกส์ และหลักการทางวิศวกรรม โดยเกี่ยวข้องกับทักษะการ
แก้ปัญหา ความคิดสร้างสรรค์ ความใส่ใจในรายละเอียด และความ
เข้าใจอย่างถ่องแท้เกี่ยวกับกระบวนการผลิตและวัสดุ วิศวกรเครื่องกลมี
บทบาทสำคัญในการกำหนดรูปแบบการออกแบบ พัฒนาการทำงาน
และประสิทธิภาพของระบบเครื่องกล และมีส่วนช่วยในการพัฒนา
ความก้าวหน้าทางเทคโนโลยีในอุตสาหกรรมต่างๆ

200 vocabularies specific to Mechanical Engineering

1. Mechanism

In mechanical engineering, a mechanism refers to a system of interacting components that work together to perform a specific task or function. It involves the study and understanding of the arrangement, behavior, and movement of various parts within a machine or equipment. Mechanisms can be complex or simple, and they can involve various types of motion, such as rotary, linear, reciprocating, or oscillating. Understanding mechanisms is crucial in designing machines, analyzing their performance, and predicting their behavior.

2. Kinematics

In mechanical engineering, kinematics is the branch of mechanics that deals with the study of motion without considering the forces or moments that cause it. It focuses on describing the motion of objects, analyzing their positions, velocities, and accelerations, and

understanding how they change over time. Kinematics can be applied to various types of motion, such as linear, rotational, or complex motion involving multiple parts or bodies. It involves the use of mathematical equations, graphs, and diagrams to represent and analyze the motion of objects. Kinematics plays a crucial role in designing and analyzing mechanical systems and is often used in fields such as robotics, automotive engineering, and machine design.

3. Dynamics

In mechanical engineering, dynamics refers to the branch of mechanics that deals with the study of motion and the forces or moments that cause it. It involves analyzing the behavior and interaction of objects under the influence of various forces, such as gravity, friction, or applied loads. Dynamics focuses on understanding how objects move and respond to these forces, as well as predicting their future behavior and stability. It involves the application of Newton's laws of motion, equations of motion, and principles of energy and momentum to analyze and solve problems related to motion, forces,

and the resulting effects on mechanical systems. Dynamic analysis is crucial in designing and optimizing mechanical systems to ensure their performance, efficiency, and safety. It is commonly used in areas such as vehicle dynamics, structural analysis, and machine design.

4. Friction

Friction in machine engineering refers to the resistance or force that opposes the relative motion or attempted motion between two surfaces in contact. It is a natural phenomenon that occurs when there is relative motion or an attempt to move between two objects in contact. Friction can affect the performance and efficiency of machines and mechanical systems.

Friction can be categorized into two types: static friction and kinetic friction. Static friction is the force that resists the motion of an object that is at rest. It prevents an object from moving until a sufficient force is applied to overcome it. Kinetic friction, on the other hand, is the

force that opposes the motion of an object that is already in motion.

Friction is influenced by various factors such as the nature of the surfaces in contact, their roughness, the force pressing the surfaces together (normal force), and the lubrication between the surfaces. Engineers often consider frictional forces when designing mechanical systems to ensure proper functioning, reduce wear and tear, and improve efficiency. Strategies to mitigate frictional effects include lubrication, surface treatments, and the use of materials with low coefficients of friction.

5. Torque

In machine engineering, torque refers to the rotational force applied to an object or component. It is a measure of the tendency of a force to cause an object to rotate about an axis or pivot point. Torque is typically denoted by the symbol ' τ ' or 'T' and is often measured in units of Newton-meters (Nm) or foot-pounds (lb-ft).

Torque can be calculated by multiplying the applied force by the distance between the axis of rotation and the point of application of force. Mathematically, torque (τ) is given by the equation $\tau = F \times d \times \sin(\theta)$, where F represents the applied force, d represents the distance from the axis of rotation, and θ represents the angle between the force vector and the line joining the axis and the point of application.

Torque is a significant parameter in machine engineering as it is responsible for causing rotational motion in various mechanical systems such as engines, motors, gears, and shafts. It is important to consider torque requirements in the design and selection of mechanical components to ensure proper functioning and avoid overload or failure. The ability to generate and transmit torque efficiently is essential for the performance and operation of many machines and devices.

6. Force

In machine engineering, force refers to a physical quantity that produces an effect on an object or system

by changing its state of motion or shape. It is an external influence that can cause an object to accelerate, decelerate, or deform.

Force is typically represented by the symbol 'F' and is measured in units of Newtons (N) or pounds (lb). It can be applied in different directions and can have varying magnitudes.

Force is a fundamental concept in machine engineering as it is essential for the analysis, design, and operation of mechanical systems. Forces are responsible for transmitting power, providing motion, and overcoming resistance or friction in machines. They are also crucial in determining the strength and stability of components and structures.

Engineers need to consider forces in the design and analysis of machine components to ensure they can withstand the applied loads and forces without failure. This involves calculating and understanding the forces acting on different parts of a machine, such as bearings,

gears, shafts, and structural elements, to ensure they are appropriately sized, materials are selected appropriately, and stress and deformation levels are within acceptable limits.

7. Stress

In machine engineering, stress refers to the internal force or pressure that develops within a material when it is subjected to external load or forces. It is a measure of the resistance of a material to deformation caused by these applied forces and is characterized by the distribution of forces within the material. Stress is an important consideration in machine design as it helps determine the strength and durability of components, ensuring that they can withstand the expected operating conditions without failure.

8. Strain

In machine engineering, strain refers to the measure of deformation that occurs in a material when it is subjected to external forces or loads. It is the ratio of the change in length or dimension of a material to its original length or

dimension. Strain is a response of a material to applied stress, representing how much it has been stretched, compressed, twisted, or bent under the influence of external forces. Understanding the strain is crucial in machine engineering as it helps in determining the deformation and potential failure of components, predicting their performance, and ensuring their structural integrity.

9. Load

In machine engineering, load refers to the forces or external loads applied to a machine or its components. These loads can be static (constant) or dynamic (varying), and they can include various types of forces such as compression, tension, shear, bending, and torsion.

The load applied to a machine or its components can come from various sources, including the weight of the materials being processed, the force exerted by other mechanical components, the pressure of fluids, or external factors such as wind or gravity.

Understanding and analyzing the loads is important in machine engineering as it helps determine the strength, stability, and durability of the machine and its components. Proper design and consideration of the loads are crucial to ensure that the machine can safely and efficiently withstand and operate under the expected load conditions without failure.

10. Deformation

In machine engineering, deformation refers to the change in shape or size of a component or material when subjected to external forces, loads, or temperature changes. It can occur in various forms, including elongation, compression, bending, twisting, or shearing.

Deformation is a natural response of materials to applied forces and is typically measured by the amount of strain induced in the material. It is important to consider deformation in machine engineering as excessive deformation can lead to malfunction, reduced performance, or failure of the components or the entire machine.

Engineers need to carefully evaluate and specify the allowable deformation limits for different machine parts, ensuring that they remain within an acceptable range to avoid any adverse effects on the machine's functionality, reliability, and safety. Proper material selection, design, and engineering analysis are crucial to minimize deformation and ensure the desired performance and longevity of the machine.

11. Vibration

In machine engineering, vibration refers to the oscillatory motion or movement of a machine or its components about a reference point. It occurs due to dynamic forces acting on the machine, such as unbalanced loads, misalignment, mechanical looseness, or external influences.

Vibration can be categorized into different types, including:

1. Free vibrations: These occur when a machine or component vibrates naturally without any external force

applied. It is based on the mechanical properties and characteristics of the system.

2. Forced vibrations: These occur when a machine or component vibrates due to the application of external forces or excitation. These external forces could be from the machine's operation, such as rotating parts or reciprocating motion, or from external sources like nearby equipment or environmental factors.

Vibration in machine engineering is a significant consideration because it can lead to a range of consequences, including increased wear and tear, reduced component lifespan, poor performance, decreased accuracy, noise generation, and even structural damage. Excessive vibration can also affect the comfort and safety of machine operators.

Engineers employ various methods to control and manage vibration in machines, such as balancing rotating parts, using dampening materials, implementing vibration isolators, optimizing machine design, and

conducting regular maintenance and inspections. The goal is to minimize vibration and ensure smooth and efficient operation, enhance machine reliability, and mitigate potential risks associated with excessive vibration.

12. Fatigue

In machine engineering, fatigue refers to the phenomenon of failure or damage to a material or component that occurs over time due to repeated or cyclic loading. Fatigue failure typically occurs when a material is subjected to alternating stress levels below its ultimate strength but continues for a significant number of cycles.

When a machine or its components are subjected to repeated loading or cyclic stress, small cracks can initiate and propagate within the material, leading to fatigue failure. Factors such as stress concentrations, material properties, surface conditions, and load magnitudes all influence the rate of crack growth and eventual failure.

Fatigue failure is a significant concern in machine engineering because it can result in sudden and catastrophic failure of critical components. To prevent fatigue failures, engineers employ various strategies, including material selection for high fatigue strength, proper design with considerations for stress concentrations and loadings, implementing surface treatments to improve fatigue resistance, and regular inspection and maintenance to detect and address potential fatigue-related issues.

Fatigue analysis and testing are also commonly conducted during the design and development phase of a machine to evaluate its expected fatigue life and ensure that it meets required safety and performance standards. By understanding and managing fatigue, engineers can enhance the durability and reliability of machines and minimize the risk of unexpected failures.

13. Creep

In machine engineering, creep refers to the gradual deformation or change in shape of a material that occurs

over time when the material is subjected to a constant load or stress at elevated temperatures. Unlike plastic deformation, which occurs immediately when the material is subjected to a high enough stress, creep is a time-dependent phenomenon that happens over an extended period.

When a material is exposed to sustained high temperatures, the atoms or molecules in the material gradually rearrange themselves, leading to a slow and continuous deformation, even at constant stress levels. This deformation is known as creep.

Creep can cause dimensional changes, such as elongation or deformation, and can compromise the mechanical properties and integrity of the material or component. It is particularly important to consider in applications where high temperatures and prolonged loading are present, such as in power plants, boilers, and gas turbine engines.

To mitigate creep, engineers can use materials with high-temperature strength and resistance to creep, employ protective coatings, improve cooling systems, and carefully monitor and control operating temperatures and stresses. Creep testing and analysis are also conducted during the design and development stages to understand the expected performance and creep characteristics of materials.

By understanding and accounting for creep, engineers can ensure the durability and reliability of machine components, minimizing the risk of deformation or failure over time.

14. Elasticity

In machine engineering, elasticity refers to the property of a material to undergo temporary deformation when subjected to an external force or load and return to its original shape and size once the force is removed. In other words, it represents the ability of a material to deform under stress and regain its original form when

the stress is removed, without causing permanent damage.

Elasticity is an important consideration in machine design as it allows materials and machine components to absorb and redistribute forces and loads, contributing to the overall flexibility, resilience, and performance of the machine. It helps prevent excessive deformation, minimize stress concentrations, and ensure that the machine can withstand different operating conditions without permanent deformation or failure.

Mechanical engineers often analyze the elasticity of materials through stress-strain relationships, such as using the modulus of elasticity or Young's modulus, which quantifies the relationship between stress and strain in a material. By understanding and considering the elastic behavior of materials, engineers can determine appropriate material selection, dimensioning, and design principles to maintain the desired functionality, safety, and efficiency of the machine.

15. Plasticity

In machine engineering, plasticity refers to the property of a material to undergo permanent deformation or change in shape when subjected to an external force or load. Unlike elastic deformation, where the material can return to its original form after the force is removed, plastic deformation involves a permanent change in the material's shape and structure.

When a material is subjected to stress exceeding its yield point, the atomic or molecular structure undergoes rearrangement or flow, resulting in a permanent change in shape. Plasticity allows materials to undergo deformation without fracturing or breaking, making it useful in applications where shaping, forming, or molding is required.

Plasticity is an important concept in machine engineering as it affects the design, manufacturing, and performance of machine components. Engineers consider the plastic behavior of materials during the design phase to ensure

that components can withstand the expected forces and deformations without failure or excessive strain.

Plasticity is often analyzed using stress-strain curves, specifically by studying the yield point, yield strength, and various material properties related to plastic deformation. By understanding and predicting the plastic behavior of materials, engineers can optimize machine design, select appropriate materials, and implement processes like bending, forming, or pressing operations to shape components.

However, it is important to control and limit plastic deformation in machine components to prevent unexpected failure or reduced performance. Engineers typically specify maximum allowable plastic deformation limits and implement measures, such as reinforcement or heat treatment, to enhance the strength and resistance to plasticity in critical machine parts.

16. Yield strength

In machine engineering, yield strength refers to the stress or load at which a material begins to exhibit plastic

deformation, that is, when it undergoes permanent deformation without any increase in applied stress. It is a crucial mechanical property of a material and is often used as a design parameter to determine whether a material is suitable for a specific application or load condition.

When a material is subjected to increasing stress, it goes through an elastic region, where the material deforms elastically and returns to its original shape when stress is removed. Beyond a certain point, known as the yield point, the material undergoes plastic deformation, causing a permanent change in shape or size.

The yield strength represents the stress value at which the material transitions from elastic deformation to plastic deformation. It is typically determined by conducting tensile tests on representative samples of the material. The yield strength is measured and reported in units of force per unit area, such as megapascals (MPa) or pounds per square inch (psi).

The yield strength is an essential parameter in machine engineering because it helps engineers ensure the structural integrity and safety of machine components. By selecting materials with appropriate yield strength for different machine parts and considering the expected loads, engineers can design machines that can safely and reliably withstand operational stress without experiencing excessive plastic deformation or failure.

17. Tensile strength

In machine engineering, tensile strength refers to the maximum stress or load a material can withstand before it fails or breaks under tension. It is a measure of the material's resistance to being pulled apart or stretched and is an important mechanical property considered in design and material selection for machine components.

Tensile strength is determined through a tensile test, where a specimen of the material is subjected to an increasing load until it fractures. The highest load that the material can withstand before it breaks is recorded as the tensile strength.

Tensile strength is reported in units of force per unit area, such as megapascals (MPa) or pounds per square inch (psi). It is a crucial parameter in machine engineering as it helps engineers determine the maximum load or stress a material can withstand in tension without fracturing or failure.

By considering the tensile strength, engineers can choose materials with appropriate strength for different machine parts based on the expected tensile loads. It ensures that the components can safely handle the intended operating conditions without experiencing catastrophic failure or excessive deformation. Additionally, tensile strength also provides insight into the overall reliability and structural integrity of machine components, helping ascertain their performance capabilities under tension.

18. Shear strength

In machine engineering, shear strength refers to the maximum stress or load a material can withstand before it fails or fractures under shear, which involves forces parallel to the cross-sectional area of the material. It

represents the material's resistance to being cut, sliced, or deformed when subjected to opposing forces in opposite directions along parallel planes.

Shear strength is a crucial mechanical property considered in machine design and material selection, as many machine components experience shear forces during operation. Examples include cutting tools, fasteners, gears, and shafts. Understanding the shear strength of materials helps engineers ensure that these components can withstand shear loads without failure or excessive deformation.

The measurement of shear strength involves conducting shear tests or analyzing stress-strain curves under shear loading. Shear strength is reported in units of force per unit area, such as megapascals (MPa) or pounds per square inch (psi).

By considering the shear strength, engineers can select materials with appropriate strength for different machine parts based on their expected shear loads. It ensures that

components can safely handle the encountered shear forces without experiencing shear-related failures such as fractures or excessive deformation. Additionally, shear strength plays a critical role in evaluating the reliability and structural integrity of machine components subjected to shear forces.

19. Resilience

In machine engineering, resilience refers to the ability of a material to absorb and store energy when subjected to elastic deformation and then release that energy upon unloading. It is a measure of the material's ability to withstand impact or sudden loadings while recovering its original shape and size once the load is removed.

Resilience is an important property in machine engineering as it relates to the material's ability to absorb and dissipate energy without undergoing permanent deformation or failure. It helps determine the material's impact resistance, toughness, and ability to withstand dynamic or sudden loading conditions.

The resilience of a material can be quantified using the modulus of resilience, which is defined as the area under the stress-strain curve up to the elastic limit. The modulus of resilience represents the elastic energy per unit volume that a material can absorb before reaching its elastic limit.

By considering resilience, engineers can select materials with appropriate toughness and energy absorption capacities for machine components subjected to impact or sudden loadings. Components with high resilience are better able to withstand shocks, vibrations, and dynamic forces without permanent deformation or failure.

Therefore, resilience plays a critical role in ensuring the reliability, durability, and safety of machines in various applications.

20. Hardness

In machine engineering, hardness refers to the ability of a material to resist indentation, scratching, or penetration by a harder object. It is a measure of the material's resistance to localized deformation or surface wear and is