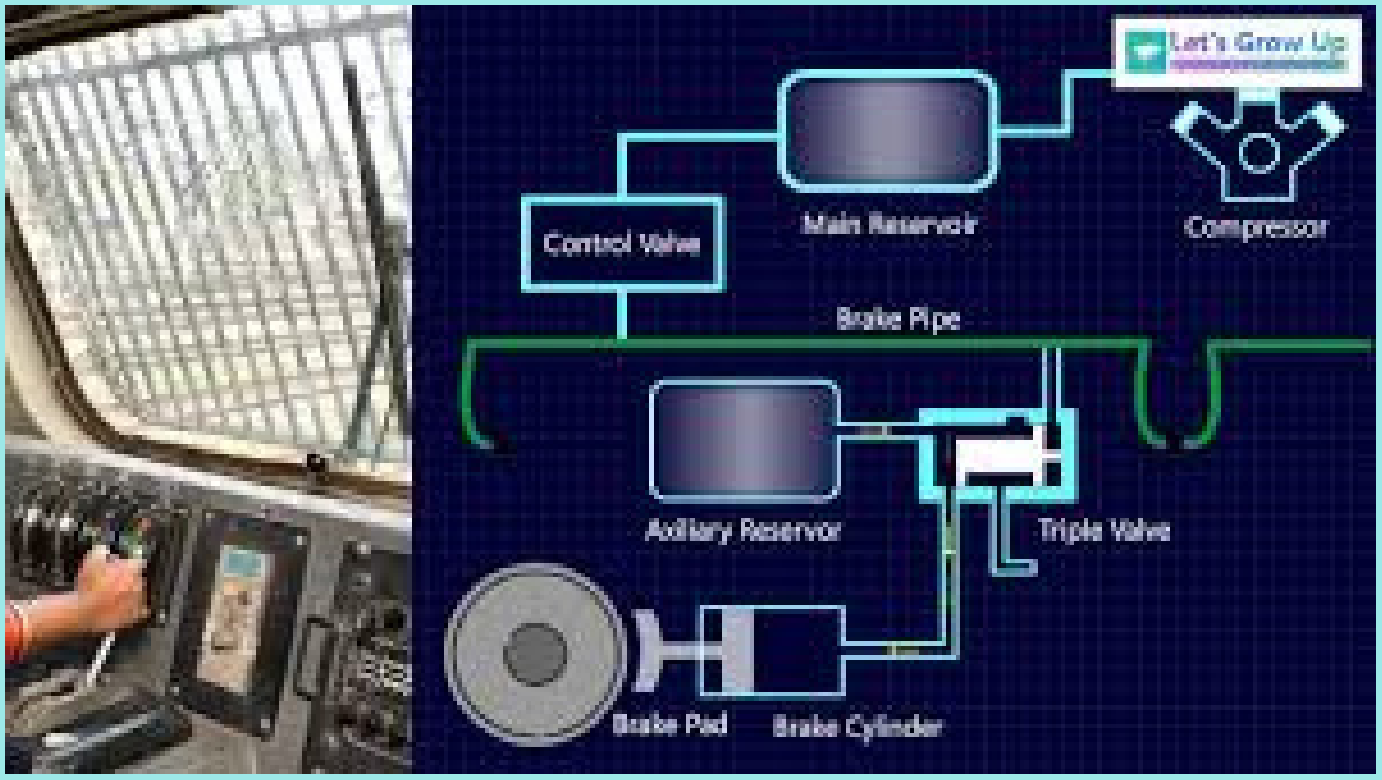
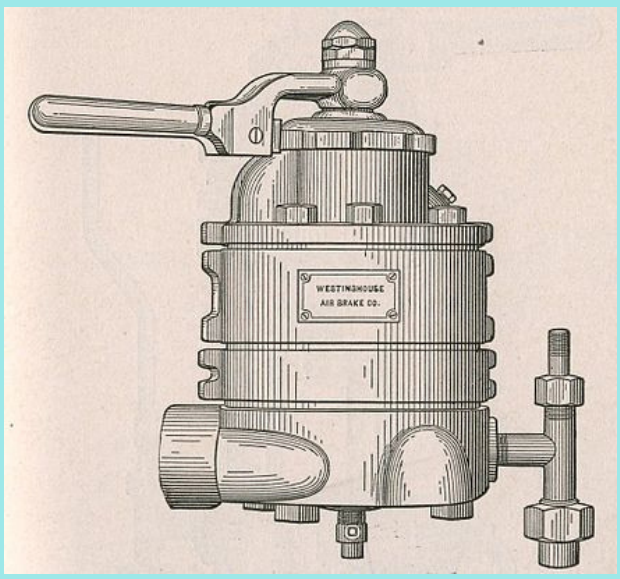
RAILWAY BRAKE SYSTEM





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Brake system

The moving train contains energy, known as kinetic energy. In order stop the train or reduce the speed of the train, the generated kinetic needs to be removed or controlled. In Railway Brake system is used to remove or control the generated kinetic energy.

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Types of Brakes

1. Hand Brakes
2. Parking Brakes
3. Vacuum Brakes
4. Air Brakes
5. Electro-Pneumatic Brakes
6. Dynamic Brakes
7. Regenerative Brakes
8. Hydraulic Brakes
9. Magnetic Brakes

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Hand brakes

The railway hand brake system is a manual braking mechanism in trains, operated by a handwheel or lever. It is used when the train is stationary or requires additional force.

The system uses a chain or cable to transmit force to the brake rigging, causing brake shoes to press against wheel treads. Despite modern braking systems, the hand brake remains a crucial safety feature.

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Parking Brakes

Parking brakes in railways, a subset of hand brakes, designed to secure stationary trains.

They prevent unintended movement during stops or when parked, ensuring stability and safety. Various types include handwheel, lever, screw, chain, ratchet, spring-loaded, and electromagnetic brakes.

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Vacuum Brakes

The Railway Vacuum Brake System is a train braking system that uses a vacuum to apply brakes. This system creates a vacuum in a continuous pipe, breaking it when activated. This pressure causes brake cylinders on each railcar to move, applying brakes. Modern trains have transitioned to more advanced air brakes due to vacuum system limitations.

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Air brakes

Air brakes are widely used in railways. They utilize compressed air to apply and release brakes on the train. The air pressure is generated by an air compressor on the locomotive, and it is distributed throughout the train via air hoses and pipes.
When the brake command is given, the air pressure is released, causing brake shoes or brake pads to press against the wheels, resulting in the train's deceleration.

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Electro-Pneumatic Brakes

This braking system combines both electrical and pneumatic components. The braking command is initiated electrically, which triggers pneumatic mechanisms to apply the brakes. Electro-pneumatic brakes offer more precise control over braking, allowing for smoother and more efficient deceleration. This includes ECP(Electronically Controlled Pneumatic)brakes and Electronic Pneumatic (EP) brakes.

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Dynamic Brakes

Dynamic braking systems are commonly used in electric and diesel-electric trains. In this system, the traction motors of the train are reversed to act as generators, converting the train's kinetic energy into electrical energy. This electrical energy is dissipated as heat through resistors, effectively slowing down the train.

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Regenerative Brakes

This systems are commonly used in electric trains. They work by converting the kinetic energy of the moving train into electrical energy, which is then fed back into the power supply system. This type of braking helps to reduce energy consumption and increase overall efficiency.

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Hydraulic brakes

Hydraulic braking systems in railways use hydraulic fluid to apply brake force, causing friction and slowing down the train. These systems are efficient and widely used in high-speed trains and light rail systems due to their reliability and effectiveness in controlling train speed.

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Magnetic Brakes

Magnetic brakes utilize magnetic fields to provide braking force. They are particularly useful in high-speed trains where traditional friction-based braking systems may be insufficient.

Eddy current Magnetic brakes generate eddy currents in a conductive material, creating resistance and slowing down the train. These brakes are used in some modern train systems for smoother and quieter deceleration.

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