VACUUM BRAKING SYSTEM

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PRESENTATION OF VACUUM BRAKE
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OVERVIEW OF VACUUM BRAKE

- **History**-

  The vacuum brake is a braking system employed on trains and introduced in the mid-1860s. A variant, the automatic vacuum brake system, became almost universal in British train equipment and in those countries influenced by British practice.
OVERVIEW OF VACUUM BRAKE

- It was an alternative to the air brake, known as the vacuum brake. Like the air brake, the vacuum brake system is controlled through a brake pipe connecting a brake valve in the driver's cab with braking equipment on every vehicle.
Parts of the Vacuum Brake System

- This diagram shows the principal parts of the vacuum brake system.
Parts of the Vacuum Brake System

- **Driver's Brake Valve**: The means by which the driver controls the brake.
- **Exhauster**: A two-speed rotary machine fitted to a train to evacuate the atmospheric pressure.
- **Brake Pipe**: The vacuum-carrying pipe running the length of the train.
- **Dummy Coupling**: At the ends of each vehicle.
- **Coupled Hoses**: The brake pipe is carried between adjacent vehicles through flexible hoses.
**Parts of the Vacuum Brake System**

- **Brake Cylinder** - The movement of the piston contained inside the cylinder operates the brakes through links called "rigging".

- **Vacuum Reservoir** - a difference in pressure between one side of the brake cylinder piston and the other.

- **Brake Block** - made of cast iron or some composition material.

- **Brake Rigging** - the movement of the brake cylinder piston transmits pressure to the brake blocks on each wheel.

- **Ball Valve** - needed to ensure that the vacuum in the vacuum reservoir is maintained at the required level.
HOW THE AUTOMATIC VACUUM BRAKE WORKS

- Vacuum brake cylinder in running position: the vacuum is the same above and below the piston
**HOW THE AUTOMATIC VACUUM BRAKE WORKS**

- Air at atmospheric pressure from the train pipe is admitted below the piston, which is forced up
TWO PIPE SYSTEM

- The usual brake pipe operated in the conventional way but the second pipe was provided to give an additional supply to speed up the brake release. The second pipe is called the reservoir pipe.
ADDITIONAL FEATURES OF THE VACUUM BRAKE

➢ ACCELERATORS

The accelerator valve is fitted to each vehicle on the connection between the brake pipe and the brake cylinder. It detects the loss of vacuum when the pressure rises in the brake pipe and opens the pipe to atmosphere on the vehicle. This eventually helps to speed up the operation on each vehicle thereby reducing the vacuum more quickly on each vehicle and therefore increases the propagation rate along the brake pipe.
ADDITIONAL FEATURES OF THE VACUUM BRAKE

➢ EQUALISING RESERVOIR

To help set the brake to the right level, some vacuum brake systems have an equalising reservoir. This is fitted between the driver's brake valve and the brake pipe and it acts in conjunction with a relay valve or "air admission valve". He monitors the lowering of the vacuum using the gauge provided in the cab. The reduction of vacuum causes the air admission valve to open the brake pipe to atmosphere.
ADDITIONAL FEATURES OF THE VACUUM BRAKE

- EXHAUSTERS/EJECTERS

The ejector consists of a series of cones inside a tube. Steam is allowed to pass through the cones so that a vacuum is created in the tube and thus in the brake pipe to which it is connected. There are always two ejectors, large and small, which provide the brake release and vacuum maintenance functions respectively.
LIMITATIONS

- the practical limit on the degree of vacuum attainable means that a very large brake piston and cylinder are required to generate the force necessary on the brake blocks.

- on a very long train, a considerable volume of air has to be admitted to the train pipe to make a full brake application, and a considerable volume has to be exhausted to release the brake.

- the existence of vacuum in the train pipe can cause debris to be sucked in.
ADVANTAGES

- simple in design.
- having the ability to get a partial release.
- with the use of additional equipment (say accelerator valves) the vacuum declining rate can be detected and its propagation rate can be enhanced.

A development introduced in the 1950's was the **direct admission valve**, fitted to every brake cylinder. These valves responded to a rise in train pipe pressure as the brake was applied, and admitted atmospheric air directly to the underside of the brake cylinder.
PRESENT-DAY USE OF VACUUM BRAKES

- Today's largest operators of trains equipped with vacuum brakes are the Railways of India and Spoornet (South Africa), however there are also trains with air brakes and dual brakes in use.
PRESENT-DAY USE OF VACUUM BRAKES

- Narrow gauge railways in Central Europe, the largest of which is the Rhaetian Railway.
- On Heritage Railways in UK.
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