

Pneumatics show their worth in a range of rolling stock systems

Frank Gevers, director, railway, fluid control and pneumatics with Emerson, explains the importance of selecting the right pneumatic device for a particular application on trains.

FROM air preparation to air-conditioning, pneumatic devices can improve train operation and passenger comfort as well as significantly extend maintenance intervals, minimise downtime and reduce maintenance costs and energy consumption. But knowing which pneumatic devices to specify for which application is important.

Railway pneumatics begin with a reliable, dry air supply. Moisture can wash out grease and cause corrosion or lead to ice build-up at low temperatures, which can disable door systems or, even worse, freeze valves in the brake control circuit, resulting in trains being taken out of service.

Most air dryers use a granular adsorption medium. Unfortunately, shock and vibration from rail operations can cause channelling, air bypass and generate dust or even lead to a breakdown of the granulate bed and reduce drying performance. This results in a shorter service life, requiring more frequent replacement of the adsorption medium.

Typically, the service interval for air dryers is less than two years. However, new developments in drying technology can extend service life and reduce maintenance costs while increasing performance. For example, Emerson's Aventics RDD air dryer series uses rolled-up desiccant drying

Emerson's Aventics RDD air dryer.

technology to provide a consistent, open porous structure throughout the media, which improves moisture uptake. The air dryer is resistant to vibration and excessive water loading and works both horizontally and vertically to improve flexibility. Furthermore, it has a service interval of at least eight years or more than 25,000 operating hours.

The design is based on two columns containing the drying medium inside exchangeable cartridges, where one column is always drying the air and the second is being regenerated by purge air. Once one column is saturated and must be regenerated, control valves automatically switch the air supply to the other column. The high moisture uptake and improved kinematics reduce the purge loss by up to 15% compared with conventional air dryer technology, thereby reducing air and energy consumption.

Extreme temperatures

The technology used to control levelling and brake control, underframe suspension and pantograph control needs to be extremely reliable, as well as sufficiently durable to withstand rugged conditions and extreme temperature ranges. Components must be easy to maintain and have a long life. Intelligent, durable and low-maintenance pneumatic components are ideal to meet a wide range of applications on trains.

The use of air for braking on trains originated in the mid-1800s. And, 150 years later, pneumatics is still the best technology to use for brake control as it is easy to maintain, exceptionally reliable and intrinsically safe.

Electropneumatic (EP) pressure regulators in train braking systems enable more accurate brake control as they provide precise control of pressure and flow with dynamic regulation, which is particularly important for service brake control.

In Emerson's ED05 Rail Series EP pressure regulator, the direct electromagnetic actuation of the integrated poppet valve allows for precise proportional control with a high flow rate and combines dynamics, precision and repeatability with durability. The robust poppet valve technology does not require any special air quality. A large cross-section and a soft-sealing proportional valve seat make the valve durable and resistant to contamination.

All the components for a complete pneumatic brake control unit, including

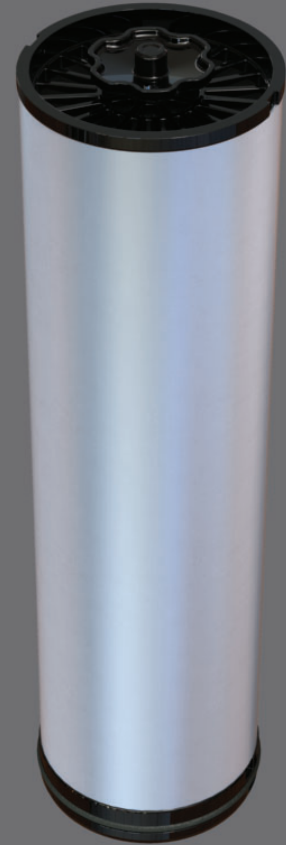
safety valves, pressure switches, ball valves and pressure sensors, are preassembled and tested on a ready-to-install control manifold for the service, emergency and spring-loaded brake function on a train.

Besides braking systems, pneumatics plays a key role in underframe suspension systems, such as the pneumatic control of air springs. An electronic levelling valve (ELV) provides significant benefits over conventional manual levelling valves and consists of one proportional valve, two switching valves and control electronics with sensors. The bus interface makes control easy and permits life condition monitoring. Control electronics optimise the control and switching behaviour of the integrated valves while minimising air consumption.

Customised, ready-to-install assemblies offer benefits over discrete components that must be assembled and adjusted separately. For example, a manufacturer designing trains for operation in London needed a faster alternative to complex and often time-consuming mechanical air suspension. Emerson customised an ELV that not only adjusts the train height to the platform level more quickly, but also decreases train air consumption and operating costs.

Pantographs must work in all conditions up to maximum line speed. The primary challenge is to maintain constant contact between the pantograph's carbon strip and the contact wire without pressing against it too forcefully. Failure to do so can lead to rapid wear or even dewirement. Pneumatic control solutions provide the dynamic performance required. Compared with electromechanical solutions, pneumatic solutions are virtually wear-free.

Emerson supplies a preassembled pneumatic control system for pantographs to a Swiss company that has made pantographs for more than a century. The pneumatic control system, which consists of a valve, precision pressure regulator, pneumatic bellow actuator and air preparation, presses the pantograph's carbon strip against the contact wire with just enough pneumatic force to maintain contact, even when tracks are uneven. These particular pantographs are approved for speeds up to about 230km/h. Further developments involving EP pressure regulators have proven their performance up to speeds of around 350km/h.



Easy to replace cartridges help to reduce air dryer maintenance.

From the moment passengers enter the train to the moment they exit, a range of pneumatic components ensure their journey is as safe and comfortable as possible. Rodless pneumatic cylinders provide reliable actuation of doors. And for those trains that require a step to bridge the gap between the train and platform, sensor-controlled cylinders in the sliding step extend and retract the step to precisely line up with the platform.

Pneumatic components are used to actuate and control HVAC systems. These components instantly close the fresh air intake, helping to protect passengers from pressure changes when high-speed trains pass one another or enter and exit tunnels. If the fresh air intake is not closed properly and quickly, pressure waves can enter passenger cabins.

Pneumatic components are required to meet current railway-specific standards. These include ratings for electromagnetic compatibility (EN 50121-3-2), corrosion resistance, fire protection (EN 45545), shock and vibration (EN 61373), and temperature.

Whether a solution is needed for new trains or a refurbishment project, pneumatics designed specifically for the rail industry will help ensure all specifications can be met successfully. **IRJ**