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Wear protection solutions in pneumatic conveyor systems

Pneumatic conveyor systems are used in many industrial sectors where highly abrasive bulk solids are conveyed. The range of bulk solids materials is diverse and, in the cement sector, may include cement, sand, lime, fly ash and pulverised fuels. These are highly abrasive substances that cause wear.

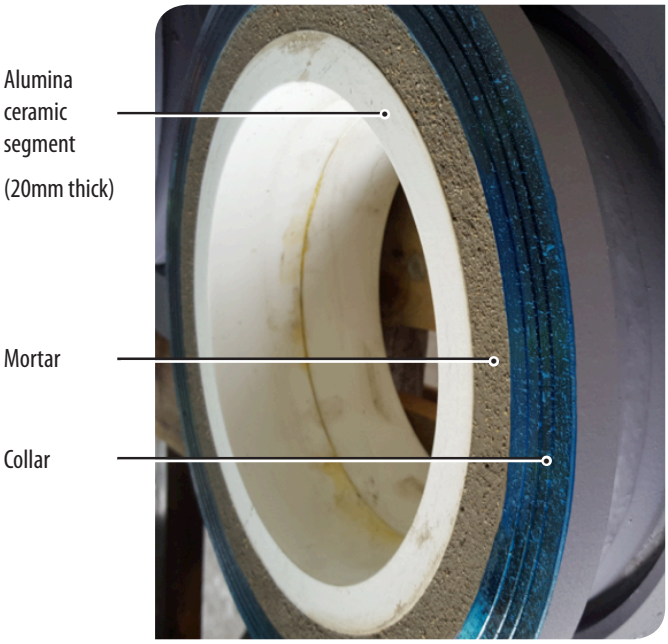
Pneumatic conveyance refers to the transport of bulk solids by air or other gas in a closed pipe system. Transport is usually carried out by transferring material from high to low pressure. There are three main methods of conveyance: Float, streak and plug flow.

Right: Pneumatic conveying lines are vital in cement plants.

Float flow: The bulk solids float through the pipe by being blown or sucked. The speed is generally quite high, usually >20m/s. The ratio between conveyed media and gas is usually <15kg/kg.

Streak flow: Part of the conveyed media flows in a streak along the bottom of the pipe and is propelled by finer particles flying above, like a sand dune. The gas speed is 15–20m/s and the load range is 25-40kg/kg.

Plug flow: The conveyor line is filled with enough conveyed material to completely plug the pipe. It is forced through the pipe by high pressure conveying gas. Loads of 100kg/kg or more are possible. Material is forced through the pipeline by the conveying gas. The gas speed is low, in the range of 3-10m/s.

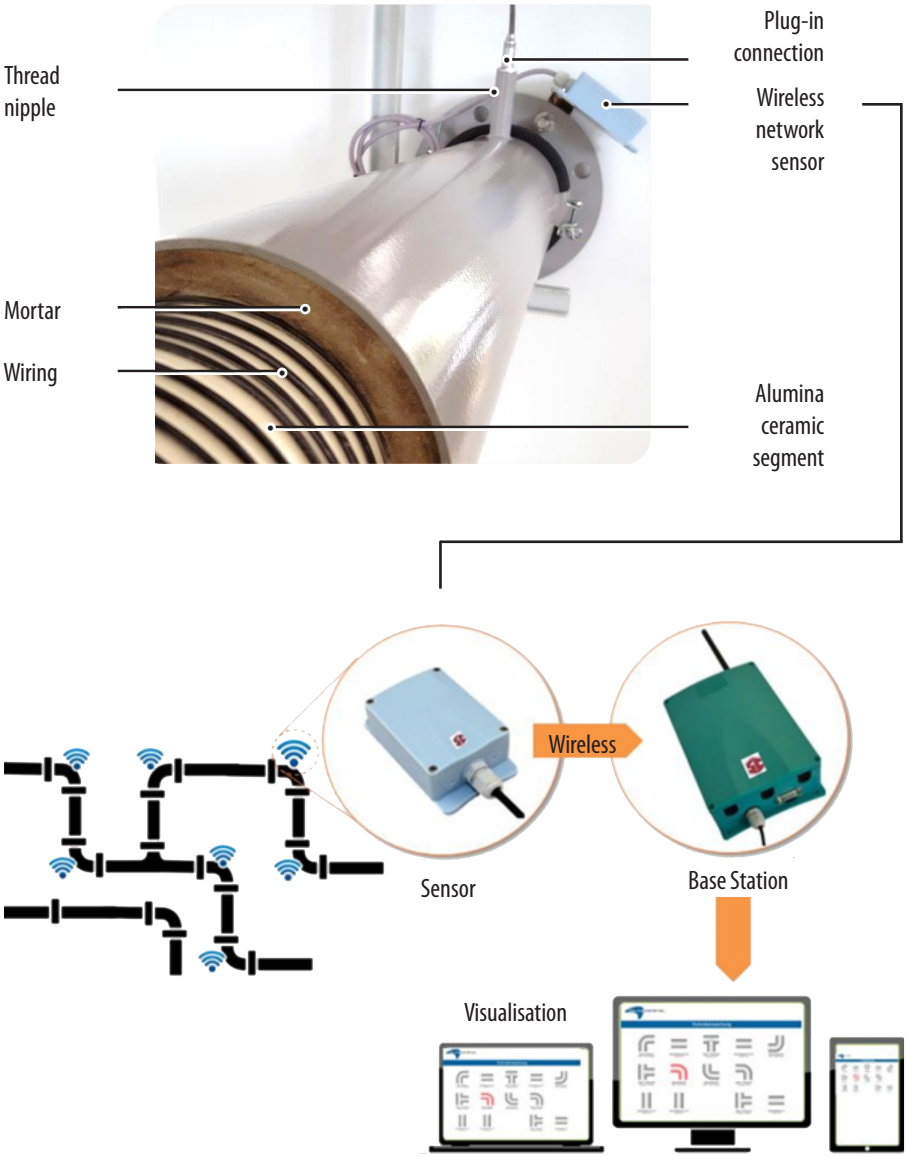


Right: Cross section of alumina-lined pipe section.

Wear protection options

In all three methods, gas and material flows are deflected and slowed down at direction changes. This will cause high levels of abrasive wear in the pipe elbows and sections of pipe immediately afterwards. This can incur high costs in cement plants, so wear protection measures are essential, particularly in regions where solids come into contact with the pipe walls.

A variety of wear protection materials have proven successful. Most frequently,



Left: Construction of a pipe with leakage detection.

Below: Leak detection sensors feed information to fixed and mobile visual warning systems.

mineral or ceramic lining materials are used, such as cast basalt, alumina or zirconia ceramic. Metallic solutions have also proven successful in some applications.

Cast basalt, with its favourable cost efficiency, and the industrial ceramic materials with their extremely long service life, are installed as a cylinder within the pipe casing. They provide enormous cost savings to the cement industry every year. For example the annual cost for a 3mm diameter hole at 8 bar pressure, are estimated to be Euro3000-10,000/yr, for the energy loss alone.

Th. Scholten designs, produces and installs early leak detection systems as an integrated solution, alongside wear-protected pipe systems and other wear-protected components, such as cyclone and mill linings, all from a single source.

Early leak detection is vital

Early-warning leak detection systems allow plants with pneumatic conveying systems to detect leaks at the very early stages via a warning signal. If the ceramic is destroyed by wear, for example inside a pipe bend, the sensor system reacts without delay.

During visualisation, the pipe component is displayed and the information required to obtain a spare part is indicated. Frequently, the repair can be carried out during standby mode, so that a shutdown of the plant, which would involve further losses in uptime and production, can be avoided.