



Putzmeister



Technology in Mining

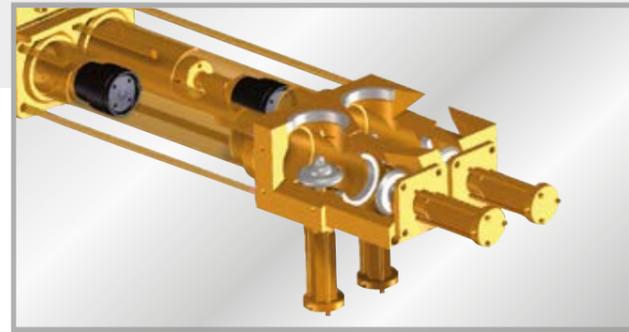
Safe and economic transportation of material

Tailings handling



24 hours a day and 365 days a year

Putzmeister hydraulically driven positive displacement pump units transfer tailings from mining operations to either a backfill system underground, or to a deposition area through pipelines within multiple kilometres.



HSP series seat valve pump



HSP 25100 HP – High performance pump for mining tailings and fly ash

The powerful solution

The gold mine Bulyanhulu, located in Tanzania, has both an underground operation where backfill takes place, and a separate paste deposition site for the tailings. This operation began production in 2001.

The two HSP 25100 HP double piston pumps with two 315 kW hydraulic power packs are designed for an output of 80 m³/h each and a delivery pressure of 8 MPa (1160 psi).

The two pump systems are installed side by side and are connected to one 200 mm delivery line. A high pressure damper is integrated in the delivery line to reduce pressure peaks.



Benefits of the piston pump at a glance

- Paste material is pumpable over long distances
- Transferring at high concentrations minimizes the water usage
- Low water seepage into the environment
- Reduced risk of embankment failure at the tailings deposit
- Stability of paste reduces the costs associated with the construction of a conventional tailings facility
- Paste pumping reduces the required tailings disposal area compared to conventional slurry embankments



Tailings transport pipeline

Backfilling

Safe and economic

Advanced mining methods such as "Cut and Fill", safety considerations, environmental aspects as well as economic reasons are some of the main arguments for backfilling.

At the heart of any backfill system is the Putzmeister double piston pump with transfer tube (KOS type) or with seat valves (HSP type), and also the accompanying ZX delivery pipeline system. For paste backfilling projects Putzmeister pumps allow high pressures in the pipeline system and therefore long transport distances.

Pumping distances up to 11 km from the central surface mixing plant to the underground backfilling area can be achieved without intermediate pumps.

Some other system capabilities are:

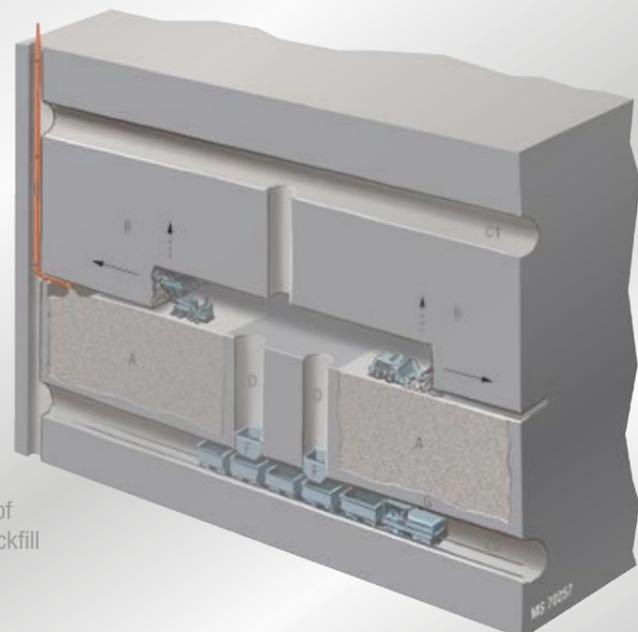
- Output up to 400 m³/h
- Operating pressures in the conveyed medium of up to 15 MPa (2175 psi).
- Suitable for abrasive material



Pump with intake shaft at Plutonic Gold Mine/West Australia



Two HSP 25100 pumps with PCF control to reduce pressure peaks (Lisheen Lead/Zinc Mine, Ireland)



- A Backfill
- B Ore
- C1 Upper stope
- C2 Lower stope
- D Mill hole
- E Packing pipe
- F Discharge hopper
- G Barrier pillar
- Direction of removal
- ↔ Direction of face advance

Systematic description of upward stoping with backfill

Advantages of the system

- Closed mine waste circuit 'mine → processing → mine'
- Improved stabilisation of mine working areas
- Increase of cut-off-grade
- Hermetically sealed conveying path for material within the pipeline
- Increased working and operation safety

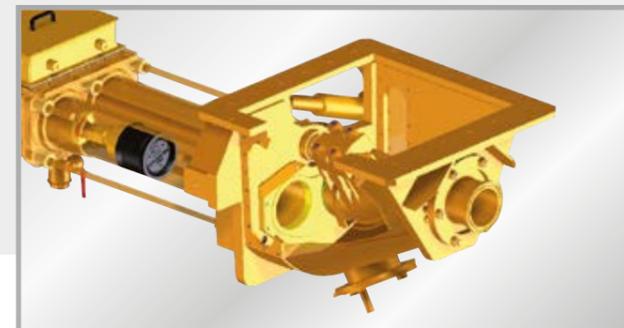
Ash transport

Economical fly- and bottom-ash transport as high density slurries

After the incineration of coal in coal fuelled power stations the resulting waste ash such as fly-ash from the electrofilters or the bottom-ashes from the boiler have to be disposed of. Most fly and bottom ashes are pumped into embankments.

By using the Putzmeister KOS type piston pumps a mixture of both fly- and bottom-ashes can be transported successfully without operational disturbances. Due to the fact that the Putzmeister KOS piston pump has no valve between the inlet and outlet of the pump even coarse particle can pass the pump without stopping the process.

High dry solid contents can be handled and water content can be reduced to a minimum. Due to the low water content the lifetime of the disposing area can be extended or a smaller disposing area can be designed. Also the environmental fact of large amount of contaminated water can be reduced to a minimum.



KOS series S tube pump

Advantages of the system

- 90 percent reduction of the water consumption compared to wet sluicing technologies
- Reduced risk of embankment failures
- Reduced water loss due to seepage and evaporation
- Reduced fresh water usage
- Reduced dust potential
- Improved use of the land fill due to surface stacking methods
- Power consumption can be reduced by 50% compared to conventional wet sluicing systems
- High availability
- Long service life
- Low maintenance and operating costs
- Service-friendly
- Compliant to Zero Liquid Discharge Requirements



Above: Fly ash hardens within a short time
Right: A KOS 25100 pump installation (Kogan Creek, Australia) for fly and bottom ash



The art of mineral ore transportation

Reliable and economical mineral ore slurry transportation is the heart beat of the mineral processing system, ensuring smooth flow of the entire process.

Putzmeister pumps are capable of transporting highest volumes from the crushing facility to their next processing step such as dewatering or intermediate storage. Strainers or Booster Pump Stations are not required to feed Putzmeister Pump Systems due to the robust and intelligent design of the pumps.

Handling of iron ore concentrate with two HSP 25200 HP in Russia, Staryj Oskol, (distance 26,5 km)

Advantages of the system

- **Highest volumes and pipeline pressure up to 150 bars**
- **Significant reduction in operating costs compared to centrifugal slurry systems**
- **Independent location of the milling facility**
- **Real Time monitoring of the system**
- **Significant reduction installation costs compared to diaphragm pump systems**
- **Low maintenance and operating costs**
- **Service Friendly as no Special tools are required for maintenance**

Mine dewatering

Every underground mine requires a mine dewatering system. In the case of the mine water being loaded with mud, Putzmeister offers a reliable wear resistant solution.

In this application the frequently used centrifugal pumps create high lifetime operating costs.

Advantages of the system

- **Energy requirements are reduced to 25 %**
- **Increased capacity – 250 m³/h (1100 gpm) is pumped at a flow rate of 2.7 m/s at a pressure of 15 MPa (2175 psi)**
- **Constant solids concentration**
- **The size of the 2.5 m delivery cylinder length guarantees low wear and quiet running**
- **The reliable technology increases availability and considerably reduces maintenance costs**
- **The pumps are fully automated and are reliable in continuous operation 24 hours/day and 7 days/week**
- **Reduced sump dewatering costs**



The HSP at work in an underground site

Coal Sludge Handling

Together with internationally operating engineering companies, Putzmeister has supplied many reliable sludge handling systems for the power industry. Our global presence allows us to do this through the supply of technology and service to projects anywhere in the world.

Fuel costs are the most important economic factor in the operation of power plants. Therefore secondary fuels become more and more important to reduce the usage of primary fuel.

Secondary fuels in bituminous or lignite power plants could be:

Reliable and cost efficient solution based on the following equipment set:

- **Reception facilities (e.g. if sludge is trucked in from another location)**
- **Storage silos to ensure a continuous feed to the combustion process**
- **Conveyance of the sludge through pipes which allows complete flexibility of routing**
- **Foreign-body separator to ensure that oversized material is caught that would interfere with the combustion process**
- **Lubricant injection system to reduce pressure loss for long transport distances**
- **Coal sludge from coal processing plants**
- **Sludge from sewage treatment plants**
- **Other materials from industrial processes with a suitable heating value**



Putzmeister Pulsation Dampening Systems

Three different methods to optimally reduce your pulsation in the pipeline

Pulsation in a delivery pipeline of a reciprocating pump is caused by the fact that the general design is based on a discontinuous working principle.

The pumps are pumping one cylinder after another into the transport pipe. This results on one hand in pressure fluctuations and on

the other hand in pressure losses – which can vary though time – due to the friction between the high-density solid and the pipeline.

Pulsation damping may be necessary for the following reasons:

- to create an approximately continuous flow
- to prevent pressure peaks resulting from water-based high-density solids (so-called Water Hammer Effect) with a low air content being pumped at great speed against a high pressure.

HPD during installation on site



HPD – Putzmeister Hydraulic Pulsation Damper

The special dampening system is for any kind of piston pump application and is used when slurry or paste is containing sand or coarse material.

The HPD literally acts as a third delivery cylinder, which is connected with the delivery pipeline by a t-flange immediately behind the pump flange. The HPD is charged during

each delivery stroke of the pump. The content of this third cylinder is actively pushed into the delivery pipeline during the changeover of the Piston pump.

This closes the delivery gaps created by the change-over process and creates an almost even flow of material.

Advantages of the HPD system

- **Hydraulically driven system**
- **Best and reliable dampening solution for hardening material (like cemented paste or slurry) with coarse material size**
- **Insensitive towards foreign bodies like stones**
- **Elimination of water hammers in the pipeline**
- **Working in different pressure levels without any manual adjustment**
- **Applicable for new installations as well as retrofit for all kind of existing pumps**

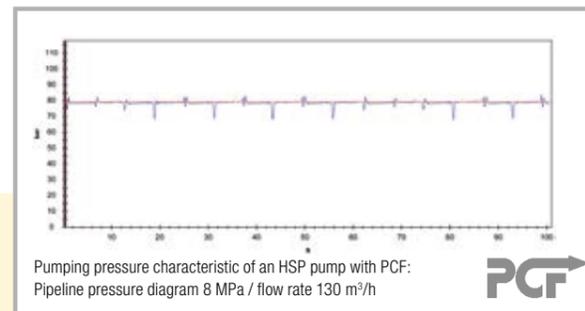
PCF – Putzmeister Constant Flow

The Putzmeister Constant Flow (PCF) System is the best pulsation dampening system for seat valve – or ball valve pumps as no additional mechanical components have to be installed within the delivery pipeline.

The only required Equipment is a Putzmeister Seat Valve (HSP) or Ball Valve (KOV) Piston Pump equipped with a PCF Hydraulic Power Pack.



HSP 25100 HPS, PCF valves, Hydraulic Powerpack HA 400 + 400 E-SP



Advantages of the VPD system

- **Economic system driven by compressed air used as a spring**
- **No wear parts (membrane) necessary**
- **No permanent loss of energy (the compressor is only needed if the output or the pressure are changing)**
- **Easy cleaning and maintenance**
- **Elimination of water hammers in the pipeline**
- **Working in different pressure levels without any manual adjustment**
- **Designed as a stand-alone unit and usually driven by a dedicated compressor**
- **Application for new installations as well as easy retrofit for all kind of existing pumps**



VPD system installed after a HSP piston pump for tailings handling

VPD – Putzmeister Ventilated Pulsation Damper

The VPD System is mounted in the delivery pipeline after the pressure outlet of the pump and consists of the dampening unit itself an air distribution and air storage unit as well as a compressor unit.

During the pump stroke of the pump, the pre-compressed air in the dampers gets further compressed by the medium. Hence, the medium rises in the dampers. During the changeover of the seat valves or the S-tube, the compressed air presses the medium downwards into the conveying pipe, whereby the pressure collapse is reduced. The amount of air needed is detected by a pressure sensor in the damping unit, calculated by the controller, generated from the compressor and provided from the storage unit.

Due to the design of the VPD it can be only used for non-hardening slurries and paste. Cemented paste must not be pumped through this system.

Advantages of the PCF system

- **Best Possible Dampening Device for Seat valve Pumps**
- **PCF is working in different pressure levels without any adjustment**
- **PCF has no membrane or other additional mechanical parts with a limited life time**
- **PCF can be used for different pumping material at the same installation, even for paste containing cement or other additives**
- **Easy cleaning and maintenance of the entire system as no additional mechanical parts have to be installed within the pipeline**
- **Can be used for hardening material (cemented paste)**
- **Reliable operation at 150 bar (2.175 psi) continuous pumping pressure can be realized with Putzmeister Seat Valve Piston Pumps (HSP)**

Shotcrete systems

Complete systems for the mining industry

Safe ground support under toughest working conditions

In mining, sprayed concrete has become more and more relevant for ground support. The usage for shotcrete in underground workings starts with the logistical problem of supplying the spraying equipment with the required construction material, and finishes with the demands of placing the material exactly where required on the mine walls. Putzmeister is the only system provider who offers total package solutions from the concrete mixing plant on the surface, to the shotcreting lining of the galleries in the mine below.

For the mining industry today the utilization of various construction materials is essential to create a safe environment and achieve high productivity even in challenging geological strata. Cement based construction materials are used predominately for ground consolidation, ventilation sealing and different civil works in mines.

Putzmeister is the competent partner for the Mining Industry, providing reliable customer orientated product solutions for owners and operators. Together with our alliance partners we are able to offer the total package in preparation, transportation and usage of construction material.



Systems engineering from a single source

In addition to pump systems, Putzmeister is providing complete project solutions for the mining industry. Buffer silos, mixing plants, pig in gates and pipelines supplement the range of pumps. A team of technicians and engineers will cooperate with the customer in identifying the most suitable solution, which frequently leads to the existing components of a customer's site providing the basis for new constructions. The Putzmeister team will assist the customer with the implementation of specific solutions and the coordination of all procedures.

However, our involvement does not end with the supply and commissioning of the plant. The training of local staff at the plant, the setting up of storage facilities for wear parts at the mine and the supply of specific service and maintenance manuals for the operation are all part of the deal, underpinning Putzmeister's image as the reliable supplier for complete systems.

KOS 2180 HP piston pump with mixer and Jumbo Trough (JT 7000)

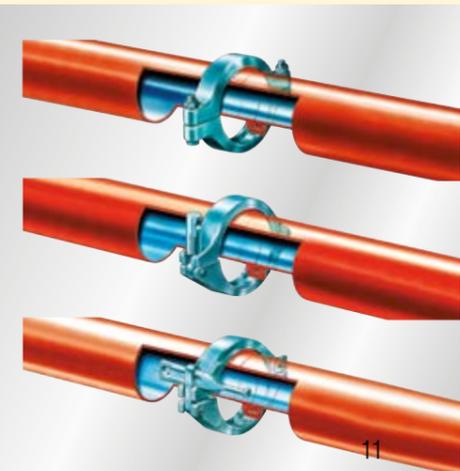


Longlife pipeline systems – extremely resilient at high pressures and with abrasive materials

Pumping under high pressure – this is where particularly high demands are placed on the delivery line. They must be absolutely leak-proof, stable and wear-resistant.

The ZX delivery line system from Putzmeister fulfils these criteria with ease, and is therefore ideal for fixed, stationary pipe systems and long-distance placement.

However, beyond construction sites, the system is tried and tested in a wide variety of industrial applications, not least due to it being absolutely leak-proof which is created thanks to the connection between male (ZXV) and female (ZXM) flanges. In this case, the O-ring inserted in a groove acts as a press-in seal which is pressed firmly in its place during assembly. In this way, the ZX system is particularly suitable for highly liquid materials and pulsating pressures. In addition to the high pressure resistance, the wall thicknesses, which are up to 11 mm, also provide a long wear lifetime.



Systems for mining applications

Underground hard rock mining

- Mobile shotcrete equipment
- Stationary transport systems
- Mobile transport systems

- Ground consolidation, injection and rock bolting
- Sealing

Surface mining

- Bench stabilization

The right pump for every application

Pump type

Field of application

Output

Pressure

KOS series S-tube pump



Backfilling and muck pumping of coarse grained slurries and paste

Foreign bodies up to 2/3 of the size of the discharge outlet can be conveyed without any issue

up to 400 m³/h
(1760 gpm)

up to 15 MPa
(2175 psi)

HSP series seat valve pump



Transport of fine grained slurries and paste like raw material, tailings, mine water, fly ashes

up to 400 m³/h
(1760 gpm)

up to 15 MPa
(2175 psi)

KOV series ball valve pump



High pressure pumping of fine slurries up to 8 MPa like waste coal, tailings, mortar and sump sludge

up to 70 m³/h
(310 gpm)

up to 8 MPa
(1160 psi)

Hydraulic power pack and control cabinet



All Putzmeister pumps are driven by a hydraulic power pack

Performance:

5.5 – 1800 kW



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