

Long Distance Pipeline Transportation of Ore Slurry

with

The logo for GEHO, featuring the word "GEHO" in a bold, white, sans-serif font with a registered trademark symbol (®) to the upper right, all contained within a black rectangular box.

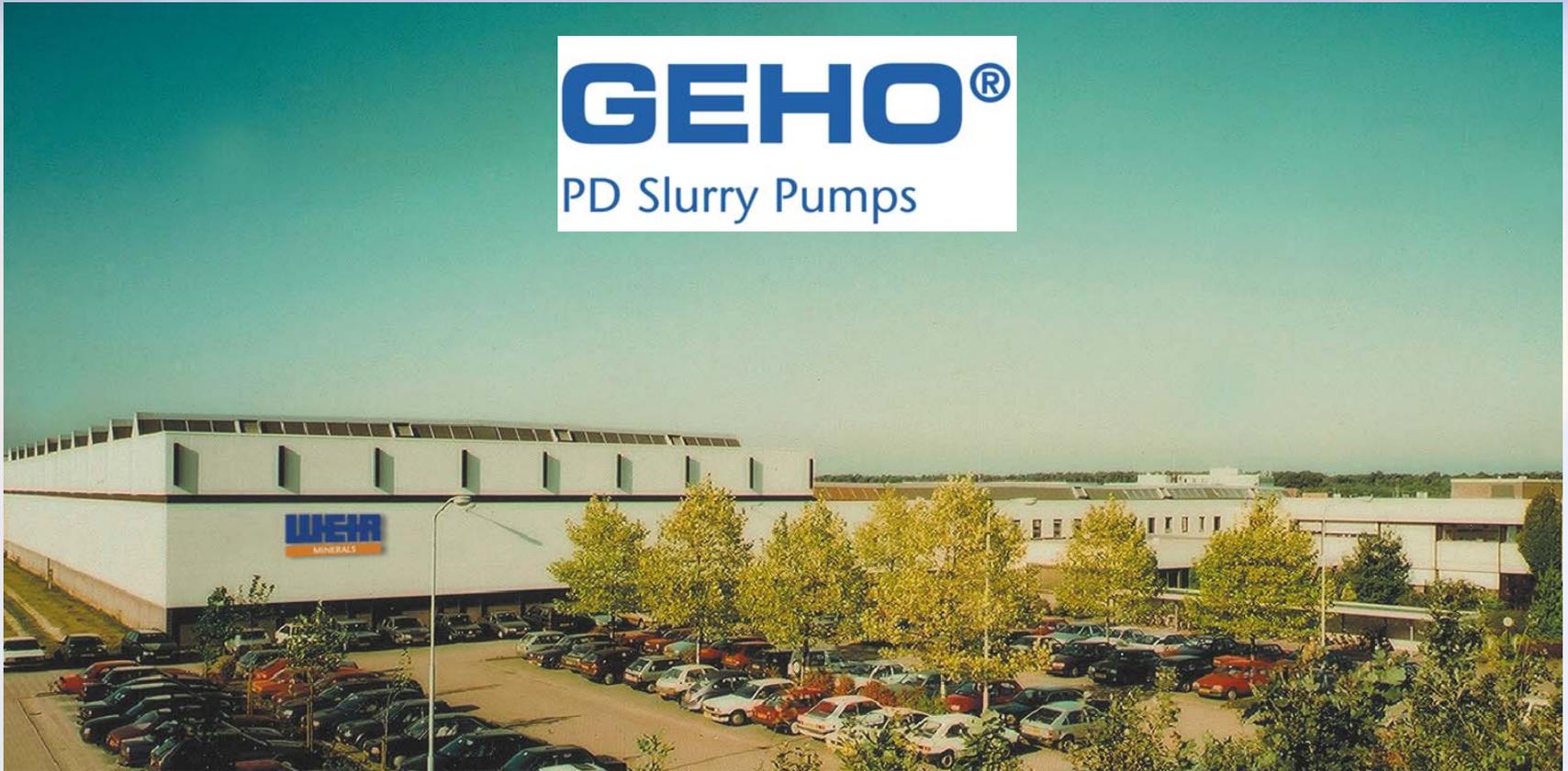
GEHO®

Content of presentation

- A brief introduction to Weir Minerals Netherlands b.v.
- why slurry pipelines?
- product introduction
- GEHO piston diaphragm pumps
- experience

Weir Minerals Netherlands b.v.

GEHO®
PD Slurry Pumps



Weir Minerals Netherlands b.v.

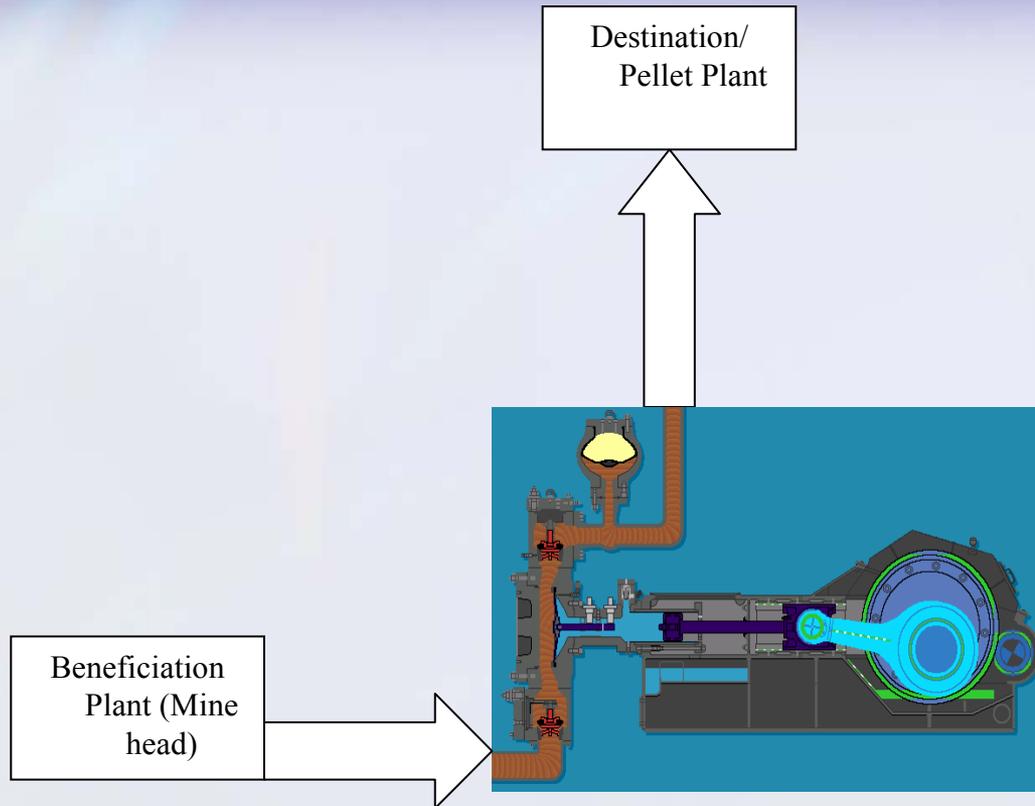
- design, engineering and manufacture of axial-flow, piston and piston diaphragm pumps and hose-diaphragm pumps
- employs 400 people
- 12,000 m² manufacturing and 2700 m² facility
- turnover Euro 140 million approx
- 90% of the annual turnover is exported worldwide
- worldwide sales and service
- innovative research & development
- ISO 9001 certified

Pipeline transport

- Piston diaphragm pumps: an economic and reliable tool for slurry pipeline



Transportation scheme



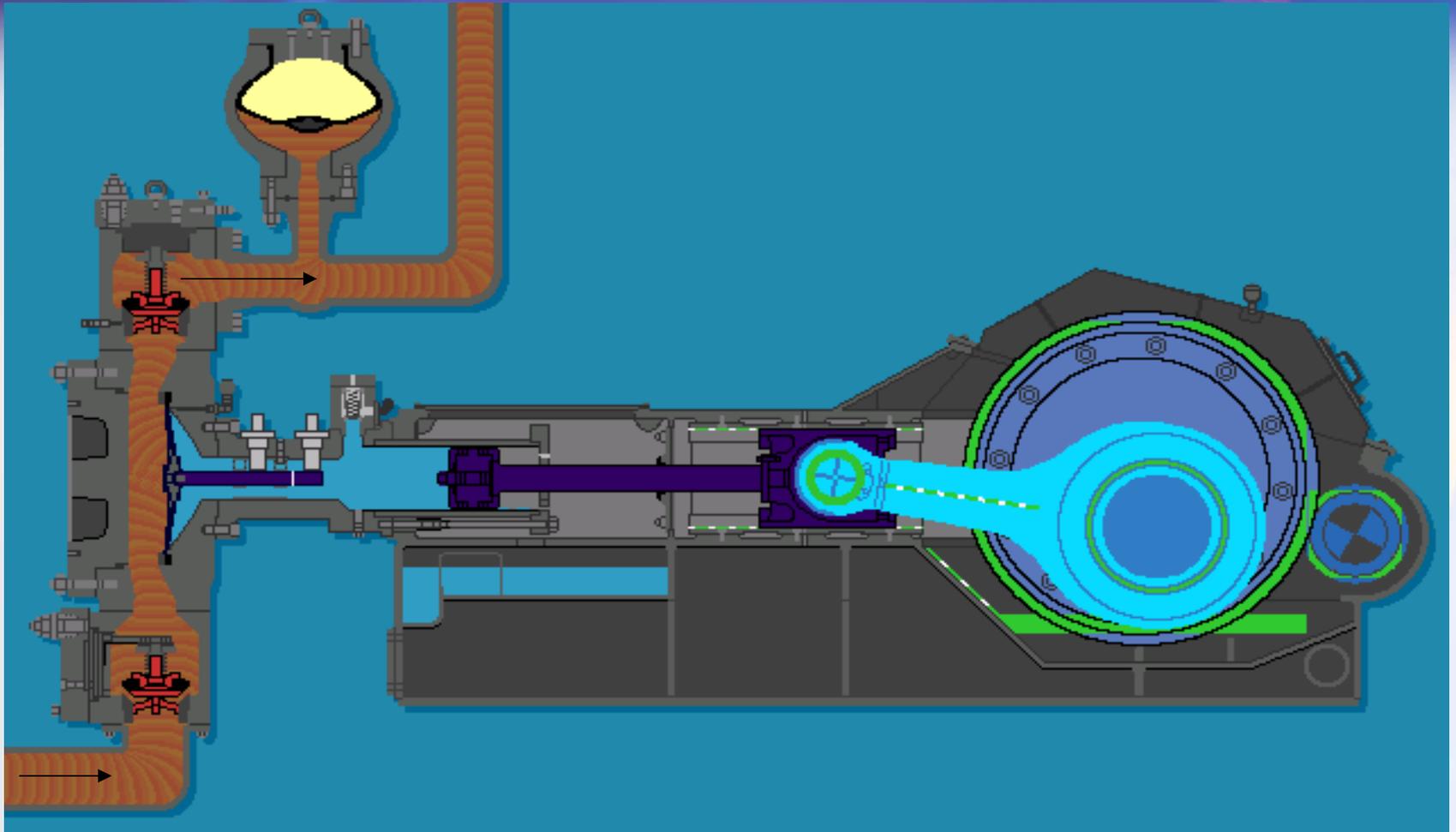
Why slurry pipelines?

- **environmental considerations**
 - *no noise*
 - *no dust*
 - *no smells*
 - *invisible*
- **mineral processing requirements**
 - *crushing and grinding at minesite*
- **length of transportation**
 - *shorter routes*
- **terrain conditions**
 - *mountains*
 - *remote area*
- **weather/climate**

Economics

- Economics of slurry pipeline systems are influenced by:
 - *initial investment costs for hardware and installations*
 - *Investment intensive items*
 - *Pipes*
 - *Pumps*
 - *annual operating costs*

GEHO Piston diaphragm pump



GEHO product range

- **GEHO PUMPS: specialized in high pressure slurry pumping**
 - *abrasive slurries (Miller numbers up to 650)*
 - *slurries ranging from pH 0,5-13*
 - *high density slurries (solids content up to 75+%)*
 - *high pressures (up to 250 bar in operation)*
 - *high temperatures (up to 205°C)*

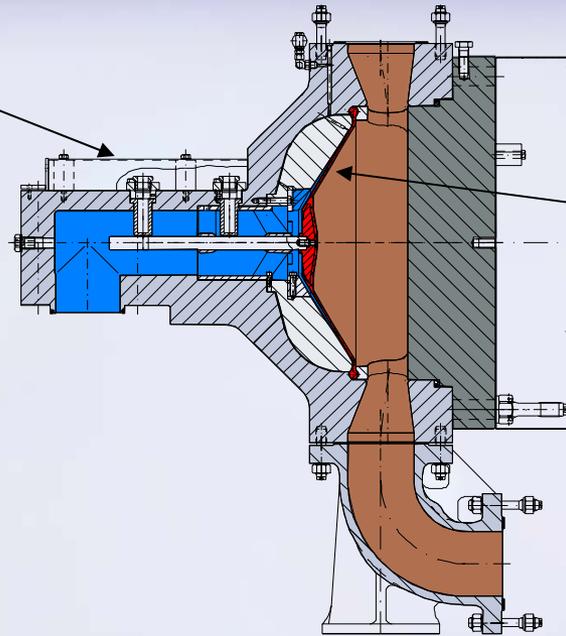
GEHO Pump Assembly (TZPM 2000)



Piston diaphragm pump features

- available in duplex double-acting and triplex single-acting

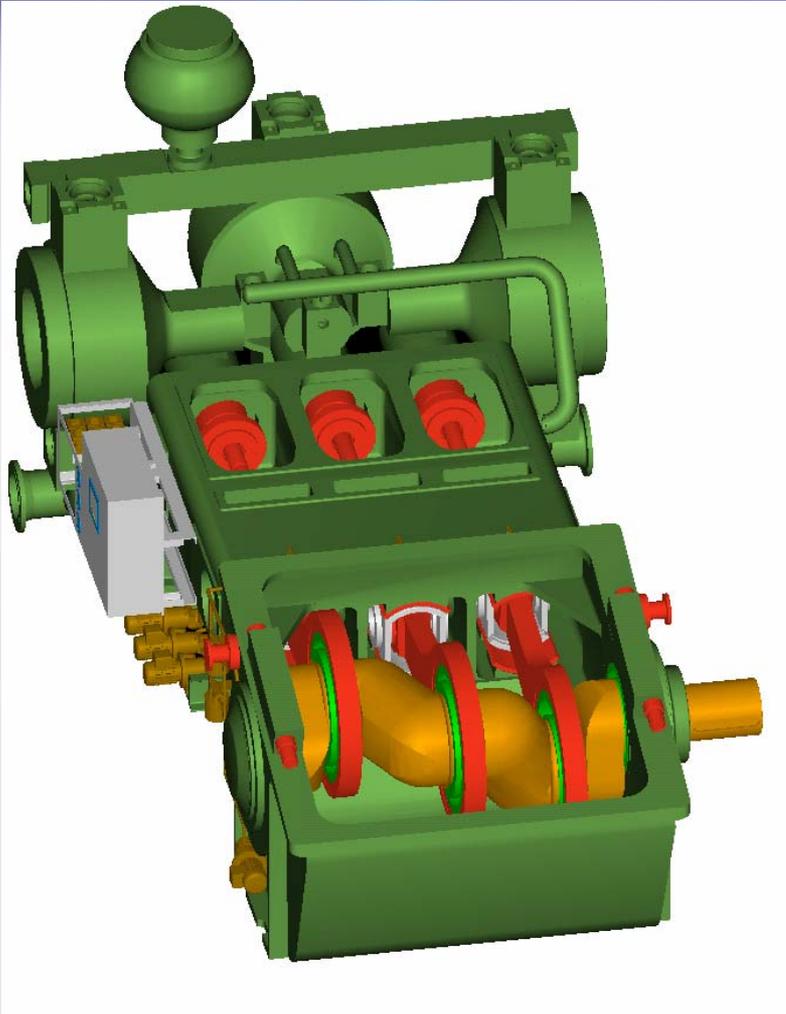
Sophisticated diaphragm stroke control system



Pre-moulded contoured diaphragm

- diaphragm separates sensitive pump parts from abrasive slurry
- only wear parts: valves

Cast power end: forged crankshaft



ZPM 900-1700
TZPM 180-2000

Advantages GEHO piston diaphragm pump

- Concept of large piston diameters and large stroke lengths - lower stroke rates => **lower wear**
- High availability (98%) => **suitable for continuous operation**
- Low stroke rates allow bigger valve sizes => *lower slurry velocity* in valves => low wear => **easy to maintain and lower spares requirement**
- **Very high efficiencies** (up to 96%) due to roller bearings and specially designed (low friction) piston seals => **savings on power requirement**
- Variable operation range (10% - 100%)
- Extensive after sales support through local representation world wide

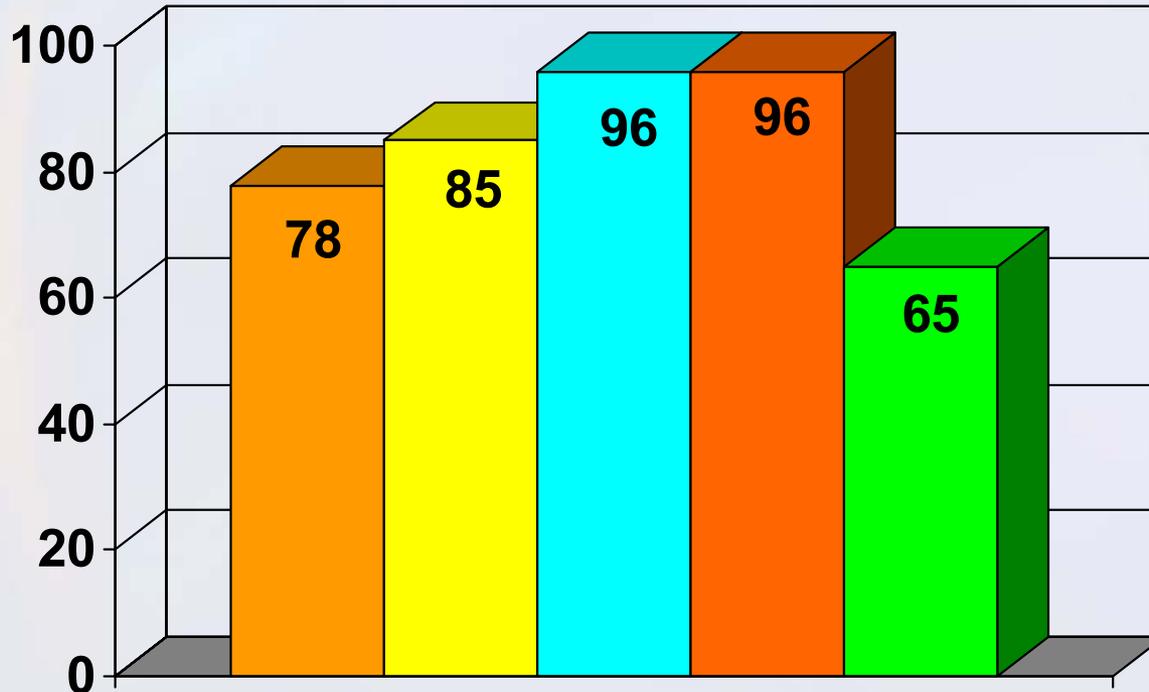
Advantages GEHO piston diaphragm pump

- no piston flushing: ***no slurry dilution***
- ***sophisticated diaphragm control*** system
- ***reduced load on diaphragms***, using light weight components, special control systems, etc.
- ***different valve concepts***, used for different applications

Pump efficiencies (depending on pump load)

Crankshaft driven piston diaphragm pumps

Compared to hydraulic piston pumps and centrifugal pumps



- hydraulic piston
- simplex double-acting
- duplex double-acting
- triplex single-acting
- centrifugal

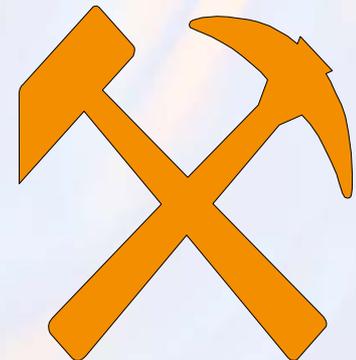
Pump types

Conclusions: Piston Diaphragm pumps

- *piston diaphragm pumps* generally are the **most economical** pump type for long distance slurry pipelines
- **GEHO** offers state-of-the-art piston diaphragm pumps with **highest reliability** and **efficiency** and **lowest operating costs**

Mining industry

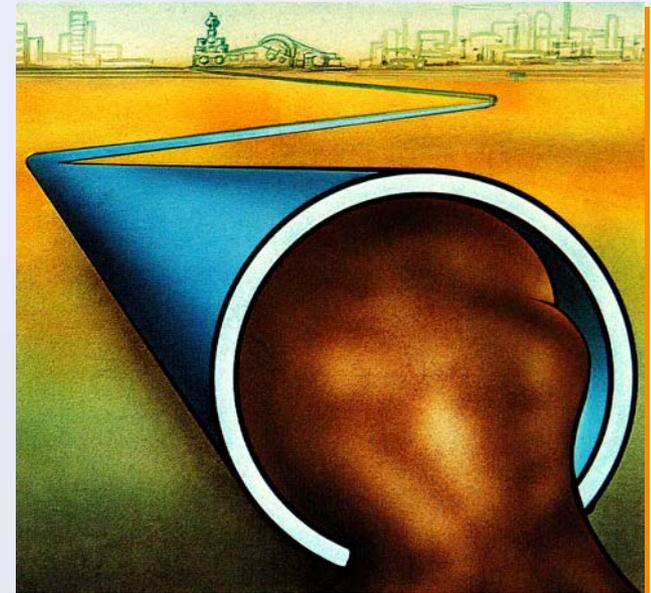
- mine desludging
- mine dewatering
- mine backfilling
- hydraulic ore hoisting
- tailings disposal



Pipeline transportation

- Ore, minerals and tailings

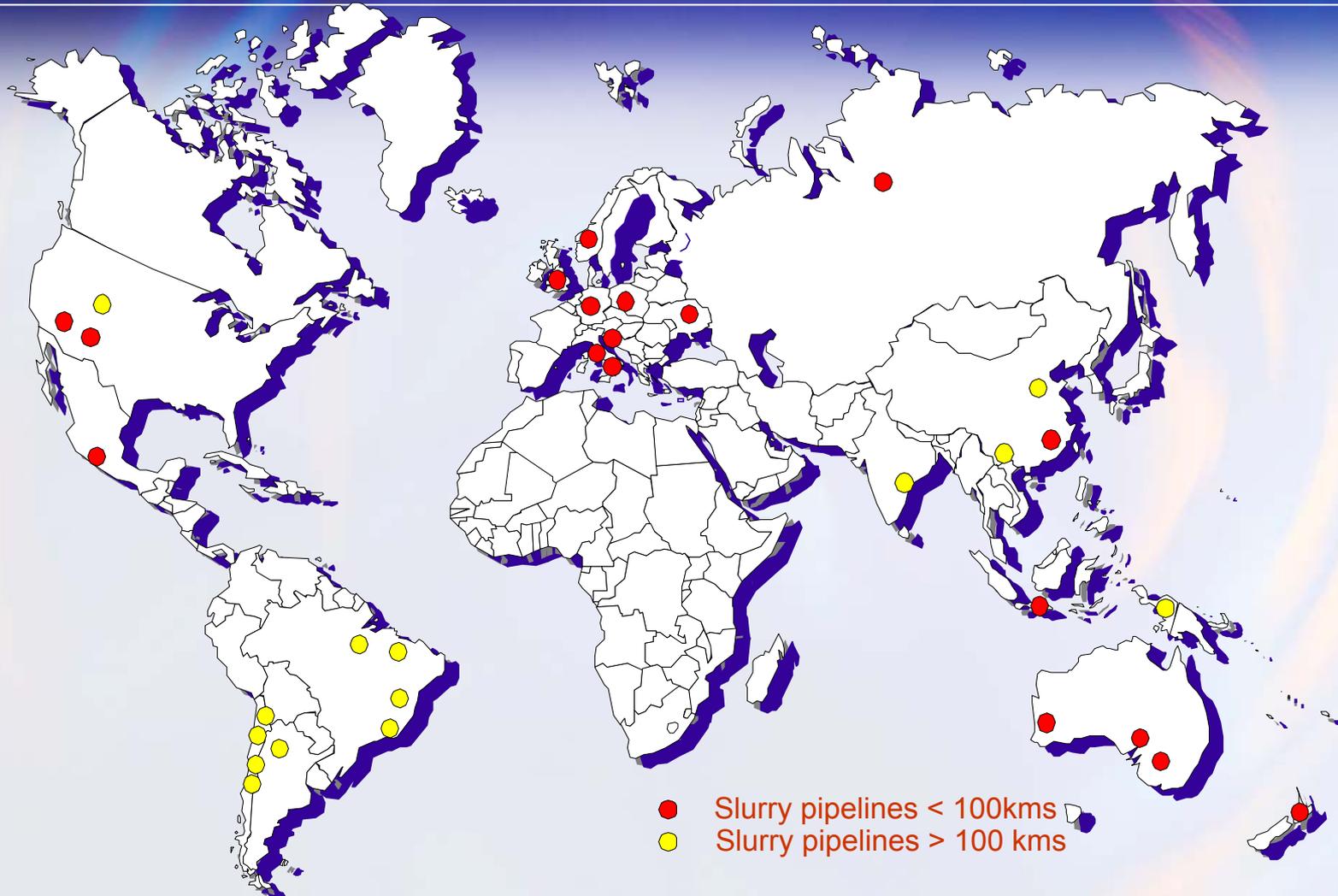
- *lead*
- *zinc*
- *phosphate*
- *limestone*
- *iron ore*
- *copper*
- *red mud*
- *bauxite*
- *kaolin*
- *gold*
- *sand and others*



Typical references long distance pipelines

- **MMX, Iron Ore Slurry Pipeline, Brasil, 550 kms**
- **Da Hong Shan, Iron Ore Slurry Pipeline, China, 171 kms**
- Paragominas, Bauxite Slurry Pipeline, Brasil, 244 kms
- **Samarco, Iron Ore Slurry Pipeline, Brasil, 396 kms**
- Simplot, Phosphate Pipeline, USA, 100 kms
- New Zealand Steel, Ironsand Concentrate Pipeline, New Zealand, 18 km
- Los Pelambres, Copper Concentrate Pipeline, Chile, 120 km
- Minera Alumbrera, Copper Concentrate Pipeline, Argentina, 310 km
- **Jianshan, Iron Ore Slurry Pipeline, China, 100 km**
- Minera Dona Inés Collahuasi, Copper Concentrate Pipeline, Chile, 203 km
- Freeport, Grasberg Mine, Copper Concentrate Pipeline, Irian Jaya/Indonesia, 120 km
- Batu Hijau, Copper Concentrate Pipeline, Indonesia, 18 km
- **Hy-Grade Pellets, Iron Ore Slurry Pipeline, India, 268 km**

References slurry pipeline transport



GEHO EXPERIENCE

GEHO's experience – WORLD WIDE

- Over 1000 pumps in operation
- Global presence
- Experience with nearly all major long-distance pipeline transportation application

GEHO EXPERIENCE

GEHO's experience with Slurry Pipeline Transportation

Longest pipeline (550 km)	: MMX (Brasil)
Highest Pipeline Pressure (240 bars)	: Collahuasi (Chile)
Highest flow (540 m ³ /hr)	: OEMK (Russia)
Total no. of Pumps	: 130 plus
Total no. long distance of pipeline projects	: 36 plus

Gains of Pipeline transportation

In conclusion, the gains of Pipeline transportation:

- Logistical problems eliminated
- Environment friendly
- Wastage eliminated
- Pipeline transportation is a economical solution.
- Approximate overall savings while in operation:
 - *MMX, Brasil (Iron Ore pipeline)* : 143 mio USD / year
 - *Hygrade Pellets, India (Iron Ore pipeline)* : 45 mio USD / year

Thank you!