# APPLICATION EXAMPLES OF THE CERAVALVE

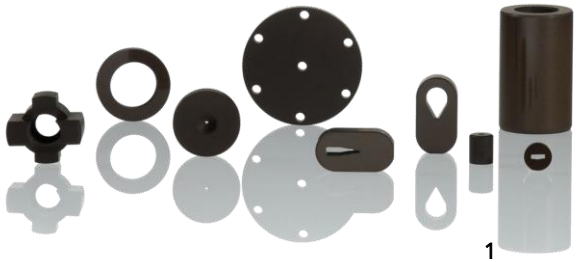
SAMSON AND EVERYTHING FLOWS









# TYPICAL APPLICATION WITH FLUIDS

- Flue gas cleaning (gypsum- and limestone-suspensions, filtrate process water)
- Steel works / iron-ore plants (coal powder to HF, melt desulphurisation: $SiO_2$, $MgO_2$, CaC)
- Polysilicon production (Silica mixture with acids, Tri-Chlor Silane)
- Titanium dioxide production ($TiCl_4$ slurry, $TiO_2$ slurry with $H_2SO_4$ or powder, coke, ilmenite)
- Waste incineration (gypsum- and lime-suspensions, pre-scrubber HCl water)
- Coal gasification (coal, tar, oil residues…)
- Fertilizer production ($H_3PO_4$ with gypsum solids, Ammonium nitrate ($NH_4NO_3$) slurry, dolomite)
- Mining (Cu-tailings, Cu with $H_2SO_4$ suspension, Ni particles with $H_2SO_4$ , $FeCl_3$ , extraction)
- Pulp & Paper ($CaCO_3$ slurry & NaOH, pulp residues, clay, recycled paper-massa, Kaolin,$TiO_2$ )
- Sugar mills (raw syrup pH neutralization with lime milk)
- Aluminium plants (Al-pellets pneumatic transport to smelter)
- FCC Cat-cracker recycling ($Al_2O_3$ dust with $N_2$, catalyst slurry recycling)
- Bio Massa (straw or sugar cane pneumatic transport with residues such as sands)
- Lithium extraction (salt suspensions)
- Yeast production (yeast slurry)
- Tar distillation (tar with impurities, oils, resins…)
- Corrosive slurries in all kinds of chemical process plants
- Pneumatic conveying systems (fly ash, sands, lime, metal ore…)

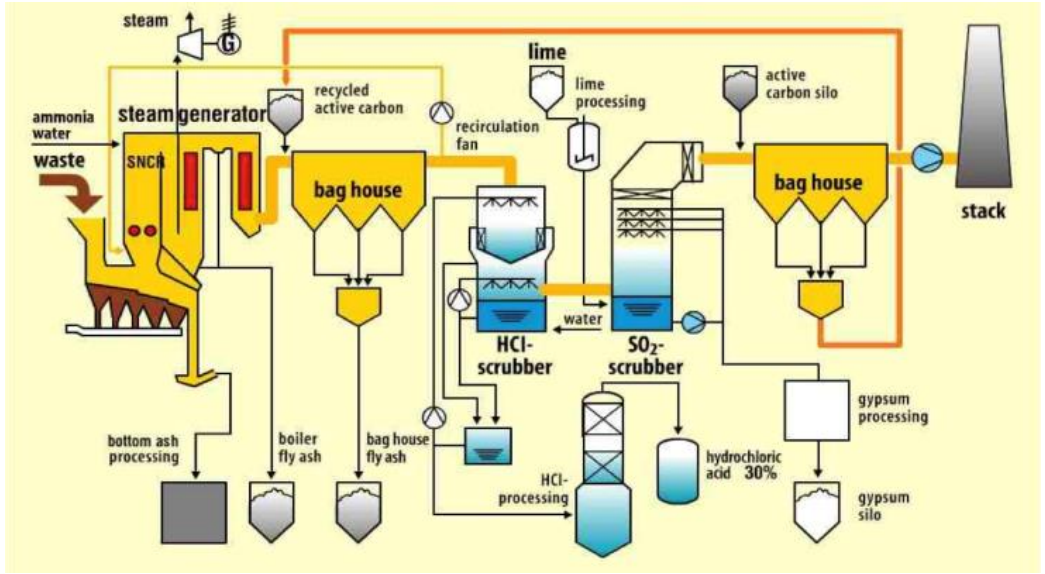
# WASTE INCINERATION

Municipal waste incinerator with flue gas cleaning (wet FGD)

Fluids used in cleaning:

- Salt suspension, 10 % solids + Cl (100 g/l), 40 °C
- HCl scrubber water, 7 % solids, pH <1, 40 °C, 3 to 4 bar
- $SO_2$ scrubber, limestone slurry, 15 % solids, 40 °C, 3 bar
- Valve types: KSV, KST, SSC



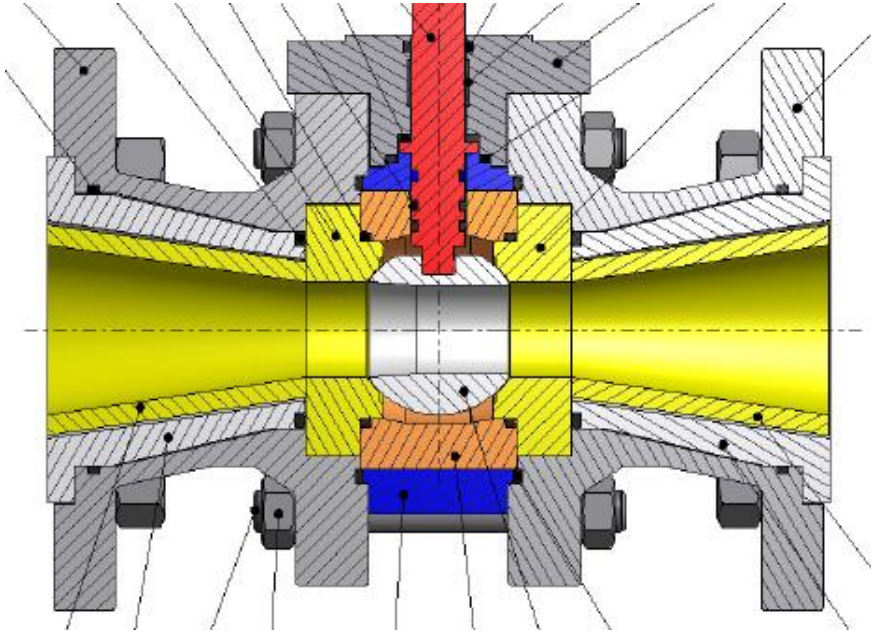







# APPLICATION: FERTILIZER

- Phosphoric acid (43 % $H_3PO_4$) with gypsum solids, 80 °C, 3 to 6 bar, density up to 1,500 kg/m³
- Ammonium nitrate ($NH_4NO_3$) + slurry, 140 °C, 4 to 8 bar (g), density 1,300 kg/m³
- Dolomite slurry ($CaCO_3$-based mineral stones), 60 °C, 5 bar, density > 1,300 kg/m³
- Nitrite solution: slurry with mixed chemicals: 0.5 % HF, 35 % calcium nitrite, 30 % ammonium nitrite, 3 % nitric acid. 40 ° C, 2 to 3 bar, density approx. 1,500 kg/m³
  Note! HF can corrode oxide-based ceramics.
- Other solids in suspension: $SiO_2$, $Fe_2O_3$,$CO_2$ etc.





# APPLICATION: FERTILIZER

The success story at OCP Morocco, SAFI site.

2 off CERAVALVE KSV+ NPS 3-1.5-3 ANSI150
were installed 2015. CERA A-154512.

Service: 28% phosphoric acids + solids @ 100°C, 5barg, ctrl valves.

Alternative to XOMOX UB 6 /PTFE (max 12 months)

End-user is satisfied and the higher price of the CERAVALVE is easily justified. Currently 12units in use.



# APPLICATION: COPPER MINING

Example: copper mining extraction (corrosive slurries after grinding)

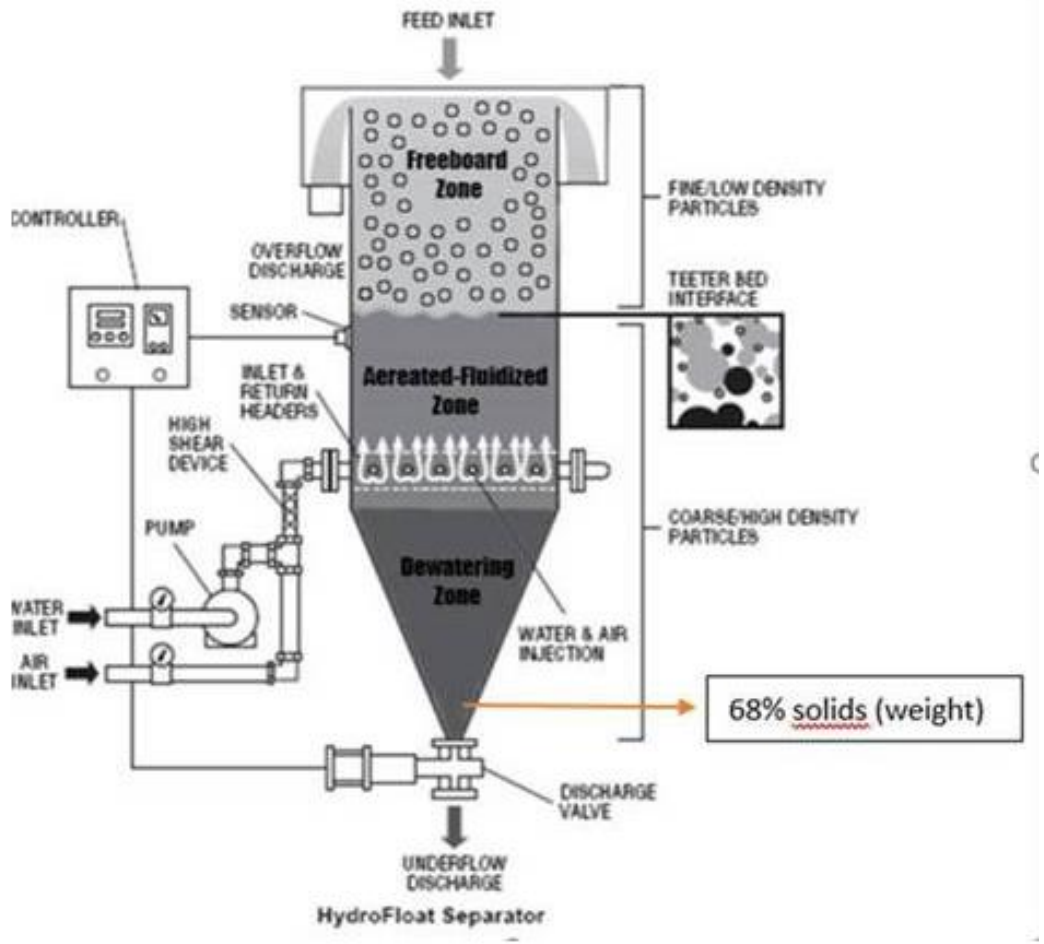
- Cu- extraction from Cu-ores: oxide ore or sulfide ore
  Fluid: 20 to 28 % $H_2SO_4$ + Cu slurry (20 to 30 %), 50 °C, 2 to 3 barg
- Floatation: separation, filtering and concentration of Cu (sulfide ore)
  Fluid: Cu -suspension (>30 % solids)
- Cu- tailing suspension (waste handling)
  Fluid: Cu-tailings (app. 70% solids)
- Cu-powder: pneumatic conveying to smelter
  Media: 18-20% Cu-powder conveyed at 5barg to the smelter for further refining.



# APPLICATION: COPPER MINING

Anglo American El Soldado / Chile / Copper mine

Hydrofloat floatation cell (separator):






CERAVALVE

KST NPS 8-6-8 150lbs

# APPLICATION: COPPER MINING




Installed: March 2021

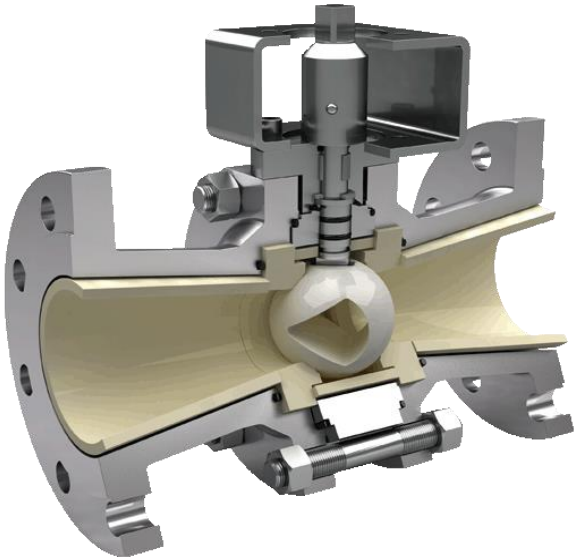
Inspection:  Nov. 2021

After 6 months in service: no visible wear

# APPLICATION: COPPER MINING

Valve application is the ctrl of tailings (abrasive, unprocessed solid waste).
Suspension with up to 70% solids. 3-4barg, amb. T.

Line sizes: up to 12”.
CERAVALVE : KST 8”-6”-8” 150lbs replaces pinch valves

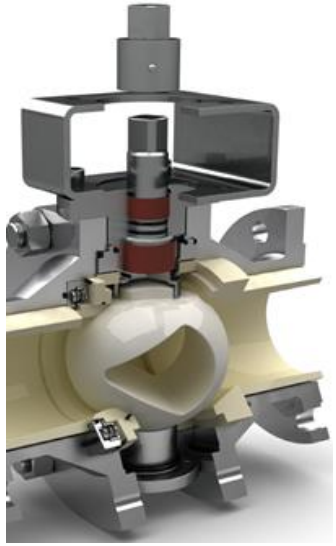


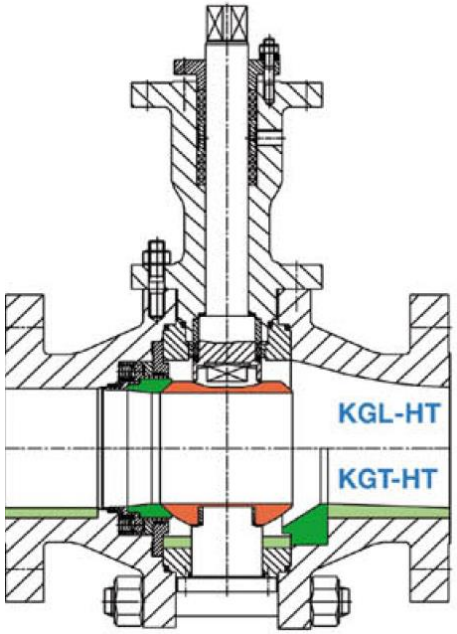


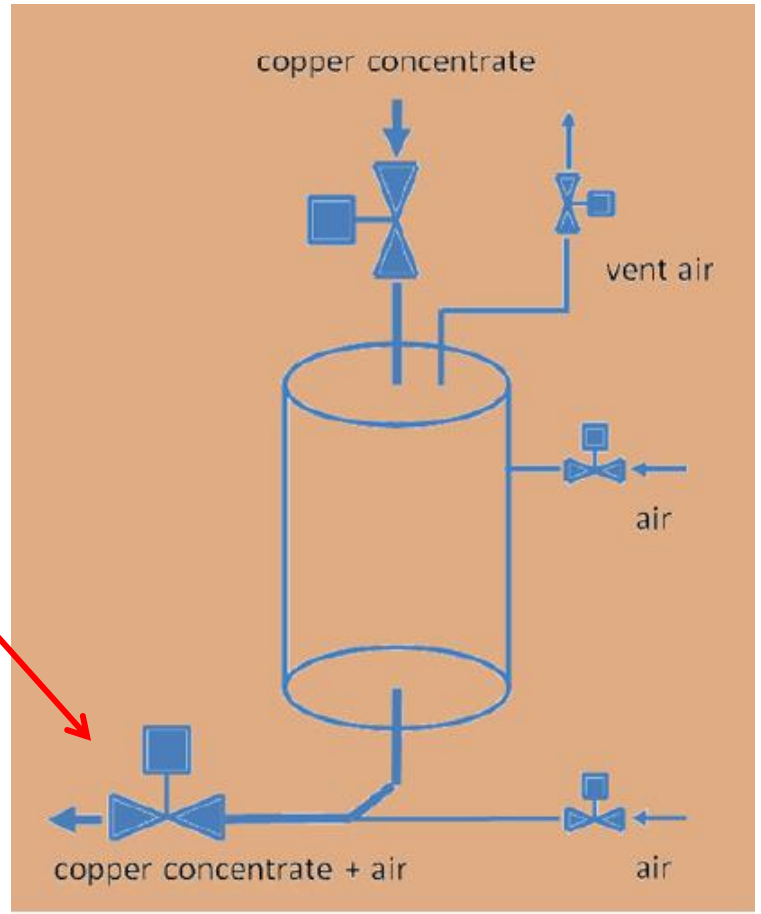
Pinch valves are inexpensive but do not last.

# APPLICATION: COPPER MINING

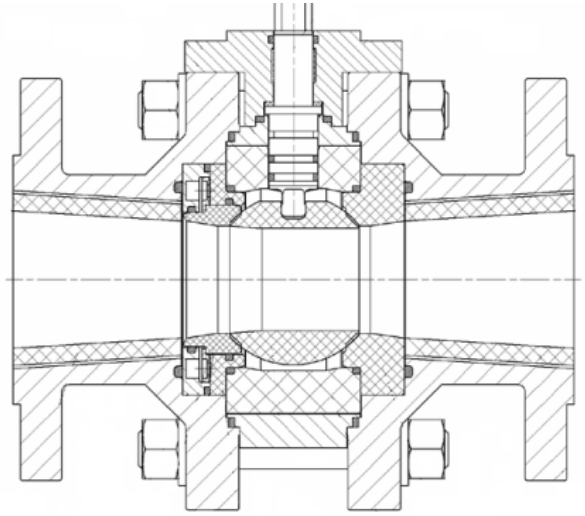
CERAVALVE KGT
4” 150lbs
Cu-concentrate +Air
5-6 barg.
Conveyor to smelter






CERAVALVE KAT, 2” 150lbs 44mm rd bore.
Replaced metal seated ball valve.
Service time improvement:
3 months to 2 years.
End-user: XSTRATA



# APPLICATION: COPPER SMELTER

MANYAR smelter PT Freeport Indonesia  2023

EPC: CHIYODA, Japan

Joint project: SAMSON / PFEIFFER / CERA

17 off slurry control valves CERAVALVE type KST

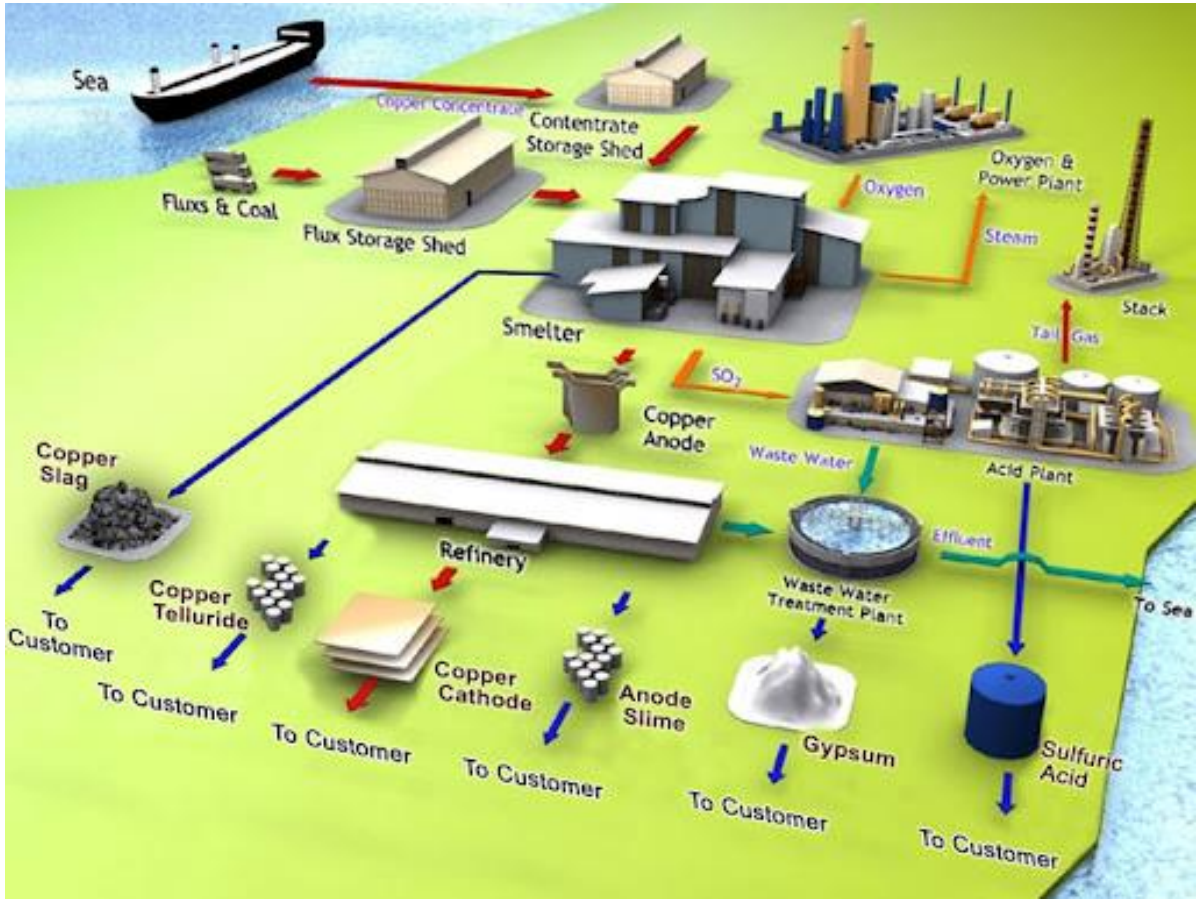
sizes NPS4 / NPS3 / NPS2 / NPS1.5  ctrl bore 150lbs.

Flue Gas Desulphurization of the copper smelter.

Fluids: process slurry, limestone ($CaCO_3$) slurry,

4-6barg; 40-60°C.

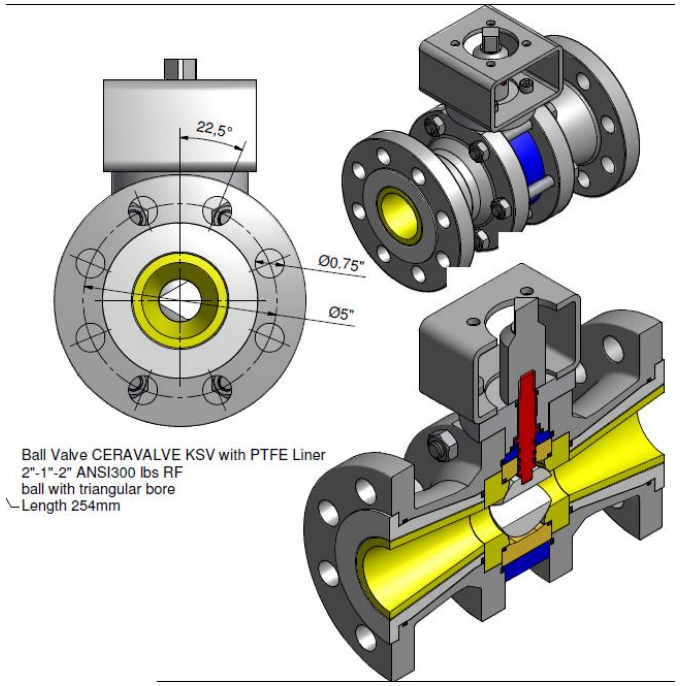
Repeat order 17 units in 2025.



# APPLICATION: NICKEL MINING

Example:
GORO Nickel, New Caledonia (VALE mining site)

- Nickel choke solution line on discharge line.
- 190°C, flow control, P1 28barg, P2 25barg
  Q- 10-25m3/hr, Ni particles with $H_2SO_4$
- Replaced Hastelloy globe ctrl valves.
- Service time increased from 4 months
  to 12 months.





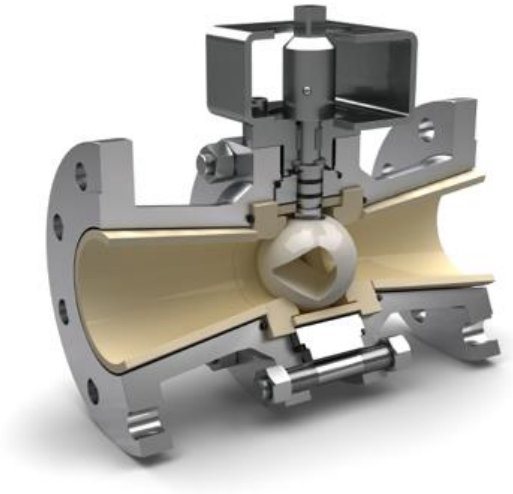

# APPLICATION: ZINC SMELTER

$ZnSO_4$ suspension with 40% solids. Leaching (after calcination / roasting Zn-ore) (Zinc sulphates)

| | |
|---|---|
| Temperature: | 60-100°C |
| Density: | 1350 kg/m³ |
| Flow: | 10-50 m³/h |
| Differential pressure: | 1 bar |

Solution:

| | |
|---|---|
| CERAVALVE type KST | DN 50-40-50 / DN100-65-100 |
| body + flanges: | 1.4462 (Duplex) or PVDF at T max.80°C |
| Stem: | 2.4605 |
| Ball: | Zirconia |
| Sleeves: | Alumina |
| Seats + socket: | Alumina |
| Gaskets: | Viton |





# APPLICATION: PULP & PAPER

Fields of application for ceramic valves

- Pulp preparation (from pulp to digester cooker)
- $CaCO_3$-slurry transport
  - Pulp + $H_2SO_4$ or sodium sulphite ($Na_2SO_4$)+ lime mud
  - Recycle paper with metal scrap (paper pins)
  - Pulp rejects from cooker/digester: pulp + lime slurry
  - Green liquor treatment + lime slurry



# APPLICATION: PULP & PAPER

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Situation:

CaCO3 slurry in pulp mill to recovery boiler

Using stainless steel globe valve, seat and globe stellited, with a lifetime of 3-4 months

Solution:

Installation of CERASYSTEM valve

Ceramic sliding disc valve type SSC 30

DN 50/PN10, Kvs 46

New lifetime over 3 years with 70%

Valve opening

Reference:

LENZING AG pulp mill

LENZING Biocel Paskov

SAPPI



# APPLICATION: PIGMENTS

SAMSON AND EVERYTHING FLOWS

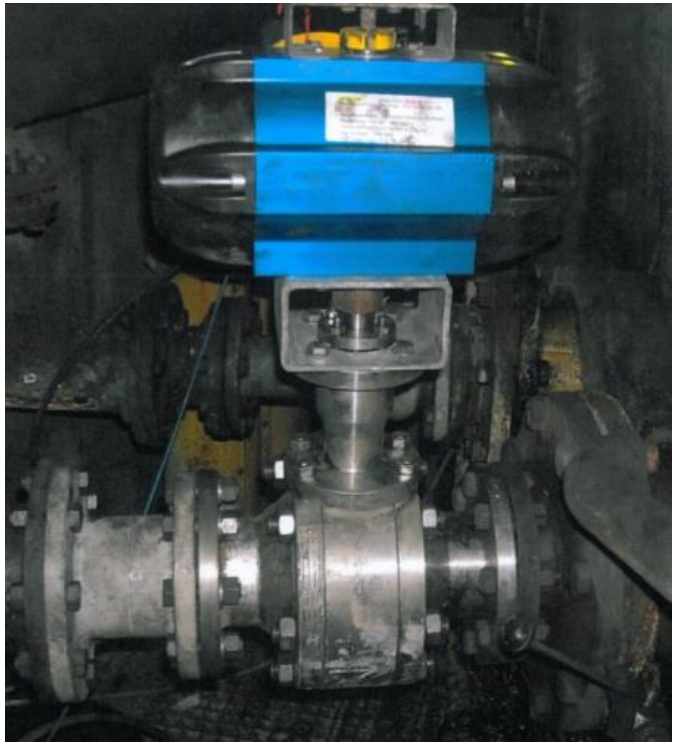
Two production methods:

- Sulfuric $TiO_2$ extraction process, fluids such as $TiO_2$ slurry: 30 % sand, solids with 28 % $H_2SO_4$ at approx. 50 °C, 3 to 5 bar, low pH, control valves

- Chlorine $TiO_2$ extraction process, fluids such as $TiCl_4$ slurry, $FeCl_3$ (metal particles in suspension)
  – Rutile ore and coke particles (pneum. injection)
  – Chlorinator side: 600 °C, $Cl_2$ vapor, rutile, coke
  – Fuller pumps application (ore feed to chlorinator)

- Secondary process: sulfuric acid recycling from diluted 20 % $H_2SO_4$ back to 98 % $H_2SO_4$

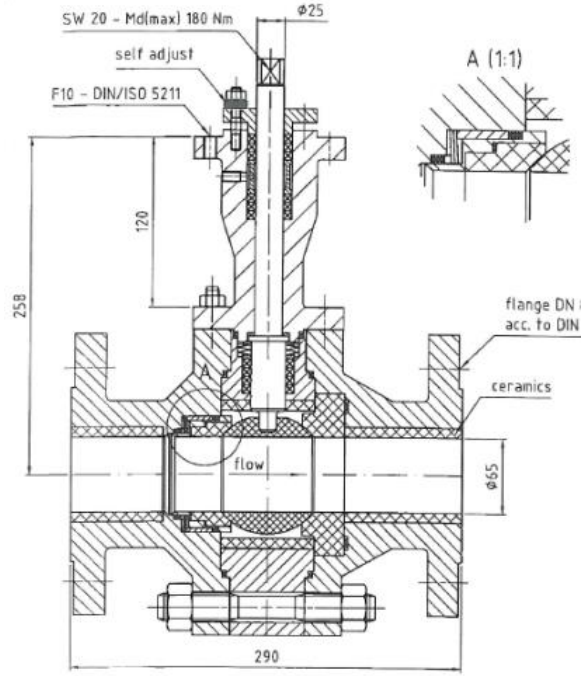


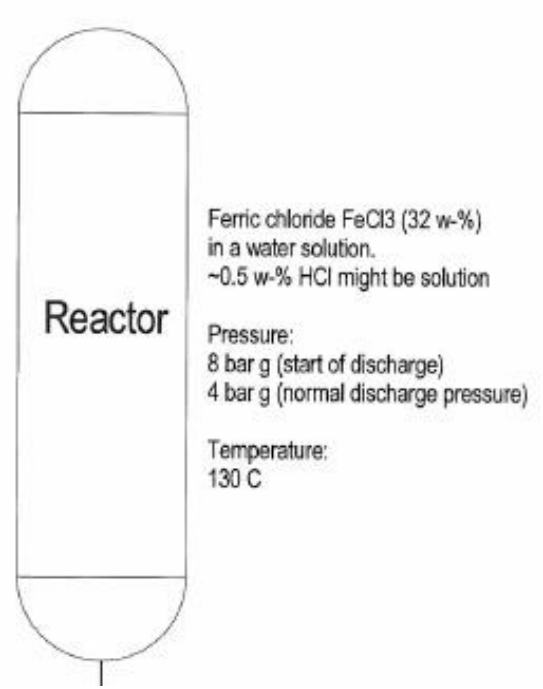


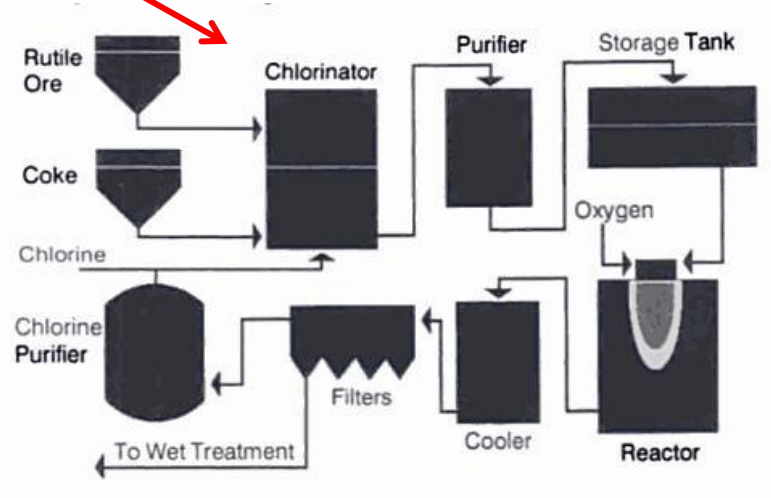
# APPLICATION: PIGMENTS

Chlorine TiO2 reaction process, fluids such as:
$TiCl_4$ slurry, $FeCl_3$ (metal particles in suspension).
Rutile-ore & coke particles (p. injection),

Ore injection into chlorinator: “fuller-pumps app.”
Chlorinator side (downstream): 500-800°C, 1barg, $Cl_2$ –vapor,
upstream side: ore, 2-3barg, 50-80°C



# APPLICATION: PIGMENTS

28% $H_2SO_4$ + $TiO_2$ slurry  control valve,  3 bar-g @ 80 °C

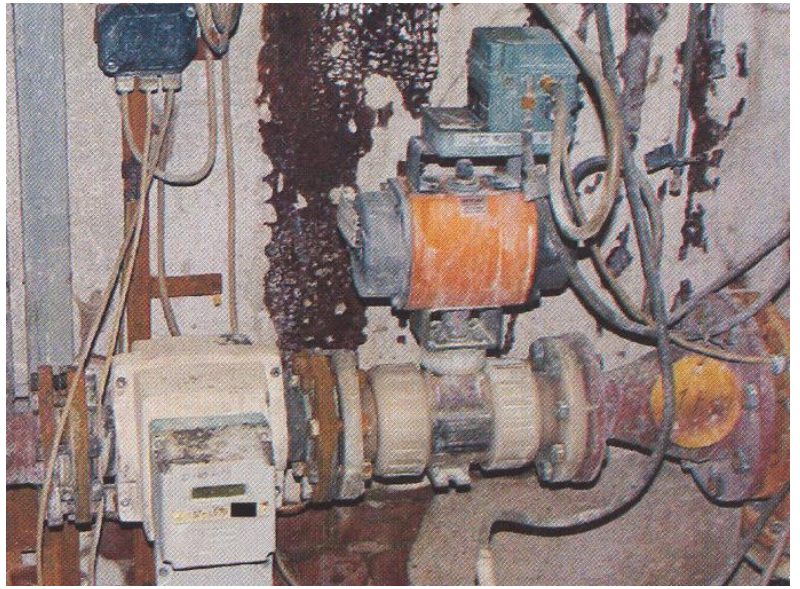


CERAVALVE KST

DN 50-25-50, PN10, Kvs 31

$Al_2O_3$ and $ZrO_2$ ceramic trim

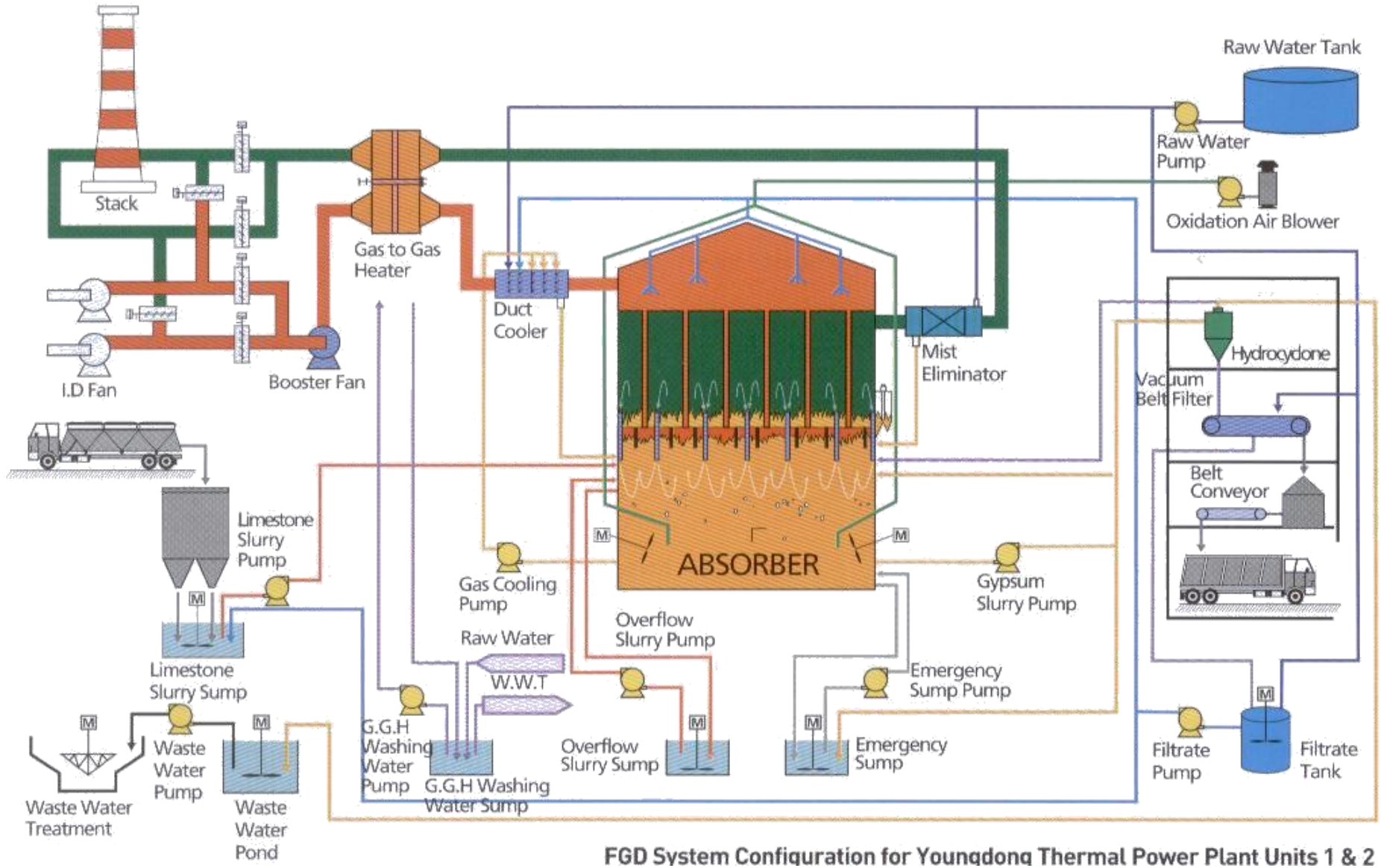
PVDF body & flanges



The major players:

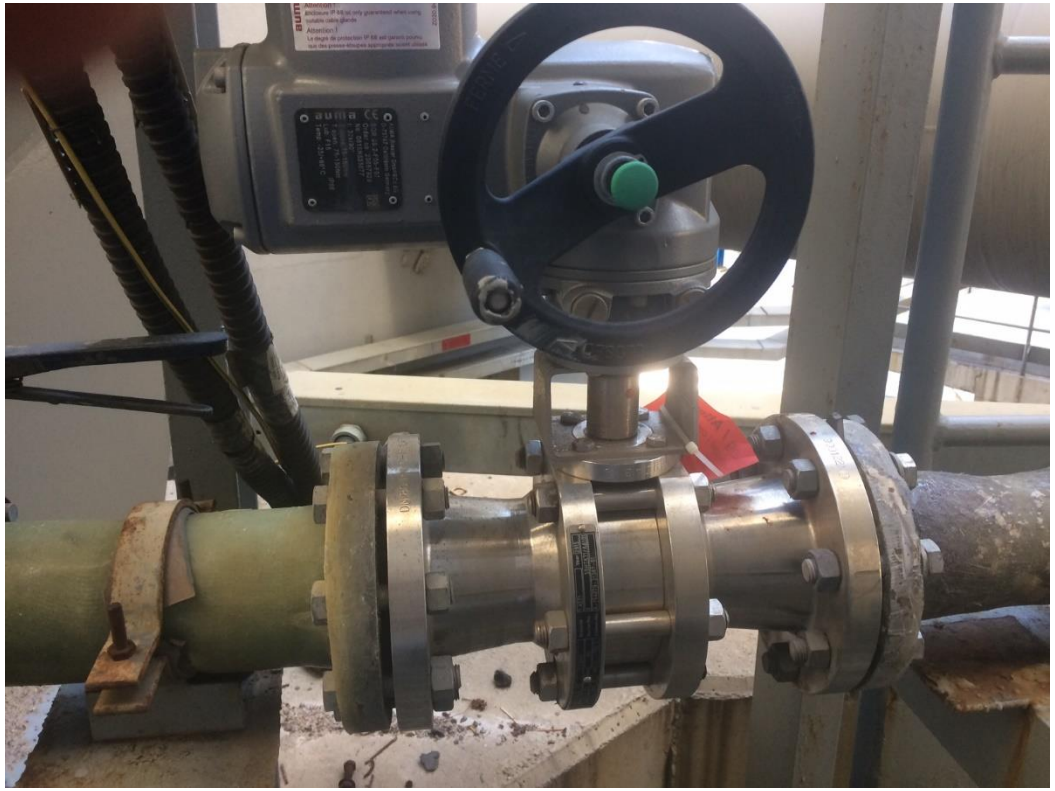
- TRONOX
- VENATOR
- KRONOS
- CHEMOURS
- LB Group  (CN)

# APPLICATION: COAL POWER PLANTS




FGD System Configuration for Youngdong Thermal Power Plant Units 1 & 2

# APPLICATION: COAL POWER PLANTS



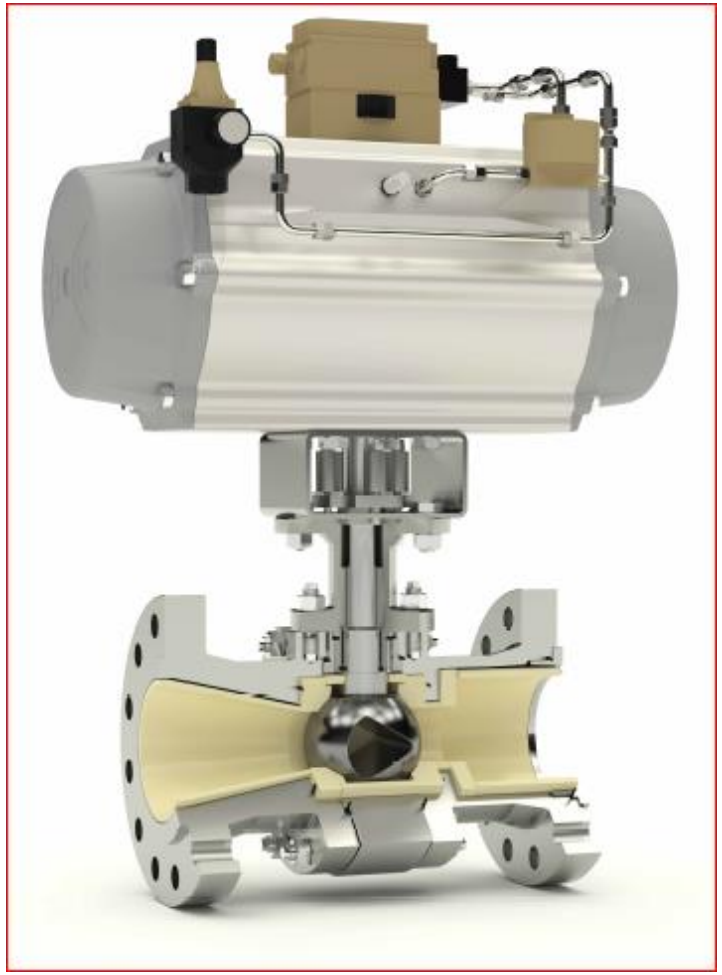
Typical abrasive fluids in coal power stations with wet flue gas cleaning:

- Limestone slurry preparation (grinding mill level)
- Limestone slurry (20 % solids) control to scrubber
- Gypsum feed (20 %) recirculation after DeSOx
- Process water (filtrate) recirculation (2 to 4 % solids)

Example: KST DN80-40-80 PN10-40, triangular bore. (A-154079 / GUODIAN Technology, PRC)
Application in FGD: limestone slurry ctrl to absorber, 20% solids, 3barg
End user: EREN ENERGY, ZETEZ III, Turkey.
Installation: 2015, non-stop service until 2020

# APPLICATION: COAL POWER PLANTS

Application: coal sluice de-pressure valve, COAL to LIQUID



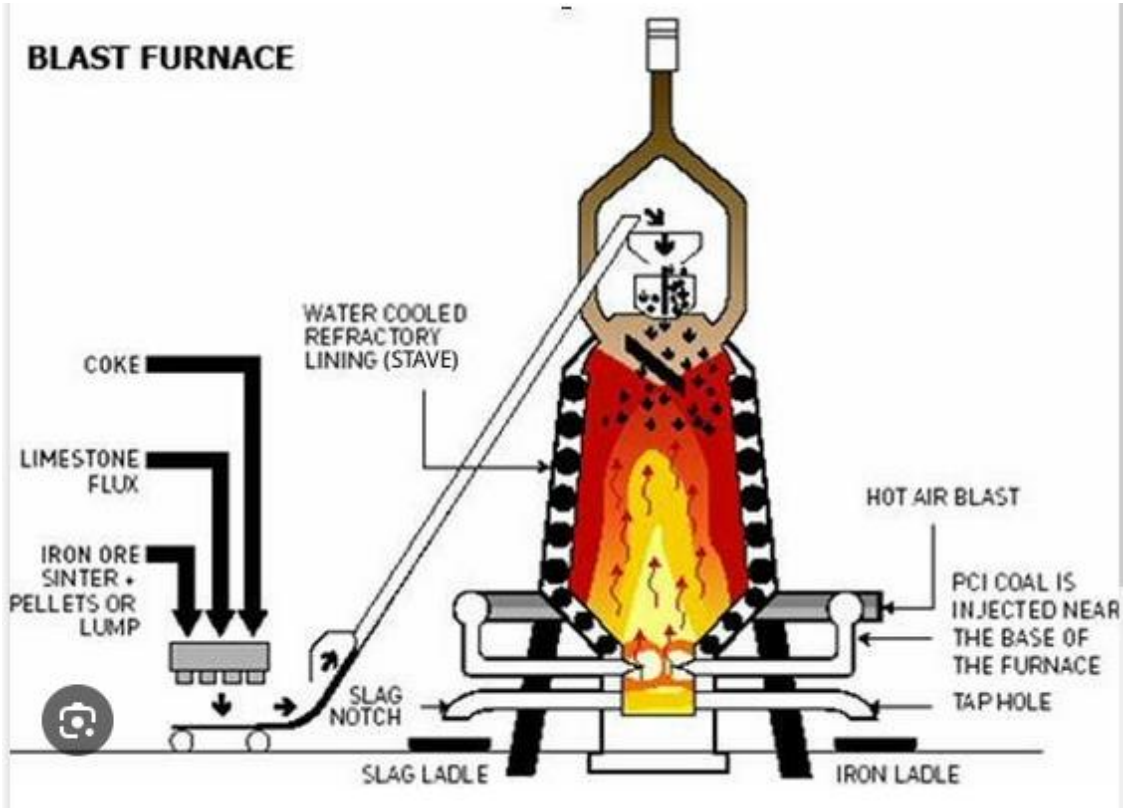
Service:
Controlled de-pressurization of the coal sluice vessel from 58barg to 3,5 barg, ambient T.
Fluid: $CO_2$ + coal powder.
Size: NPS6-4-6 600lbs

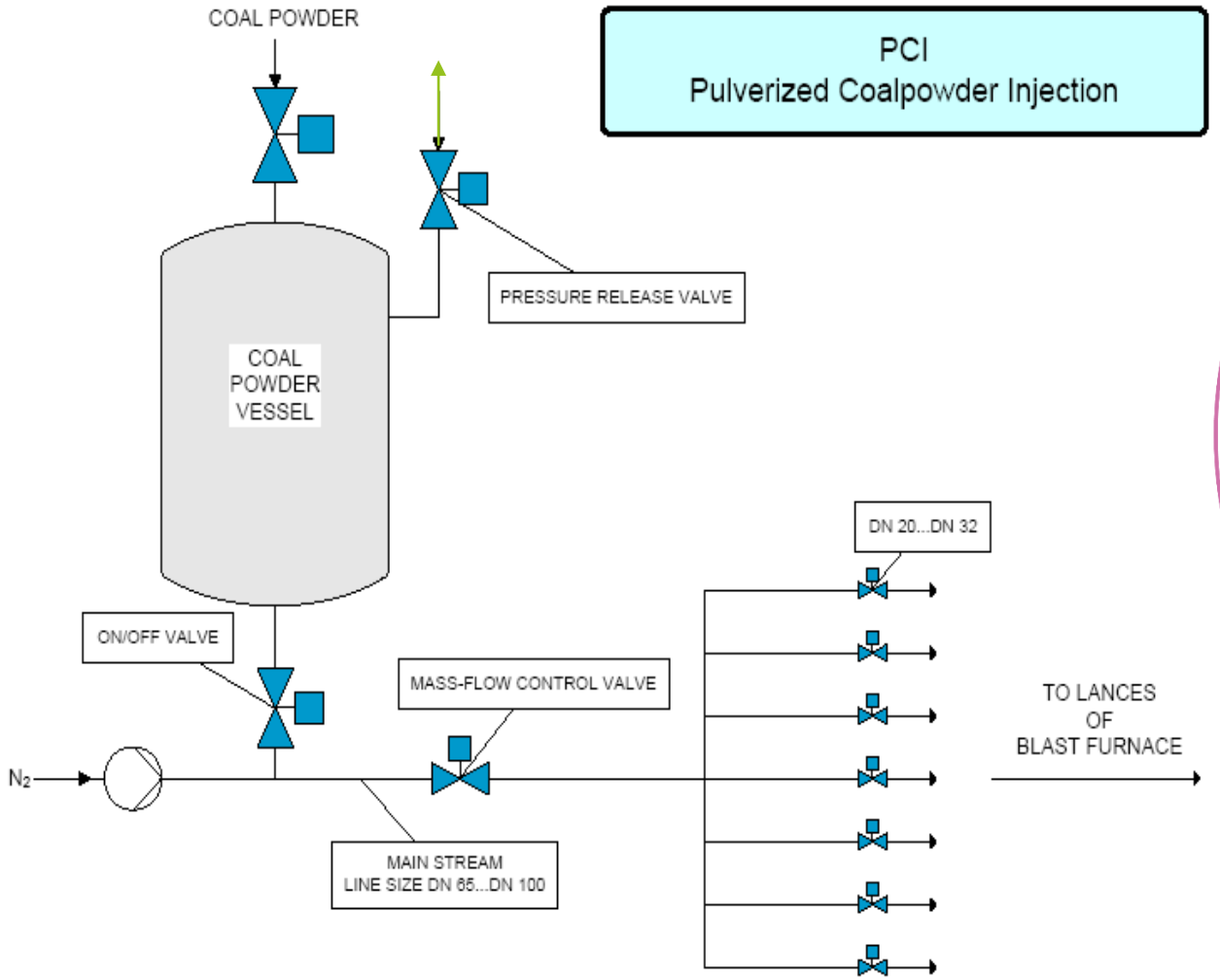
Challenge:
High speed solid coal particles are extremely erosive and destructive to metal valves !!!

Solution: Ceramic valves with tungsten carbide ball (high tensile strength).

# APPLICATION: STEEL PLANTS

Blast furnace PCI-pulverized coal injection




Valve types: KST, KAT, KGT

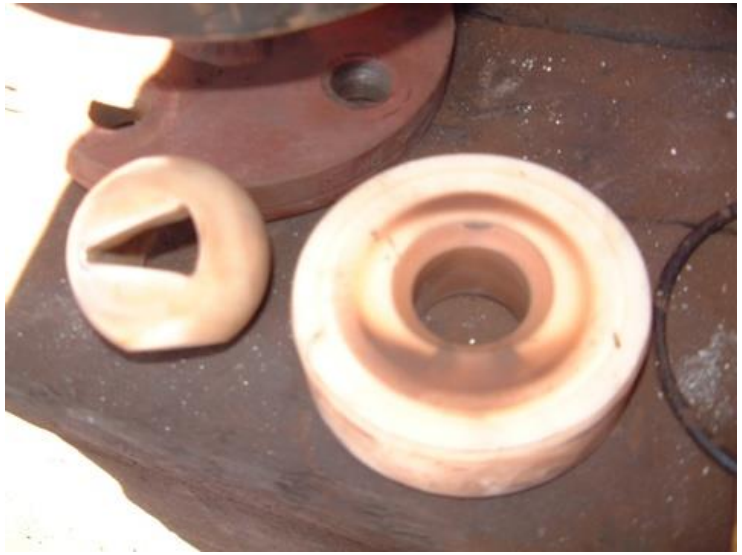
# APPLICATION: STEEL PLANTS

PCI – pulverized coal injection

Thyssen Hamborn, Germany



4 years in service = no wear



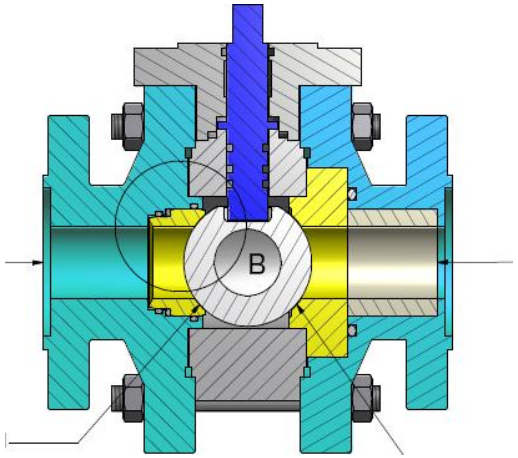
# APPLICATION: STEEL PLANTS

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Other PCI designs for coal powder lance injection systems



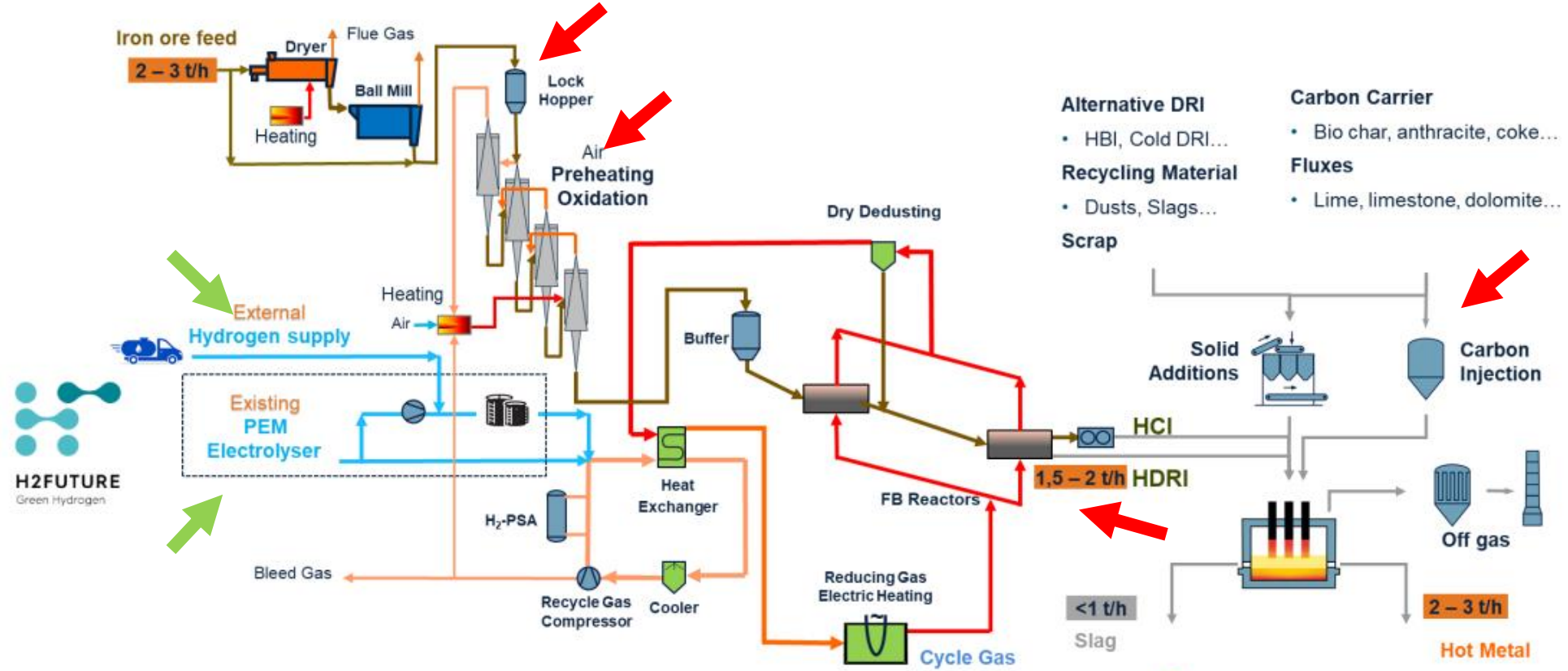


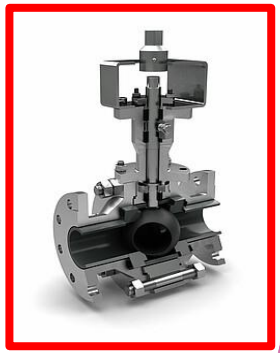



CERAVALVE type KAT/KAL direct lance injection conveyor. DN25 PN40

# APPLICATION: HDRI (HOT DIRECT REDUCED IRON ORE) HYFOR, HY4SMELT

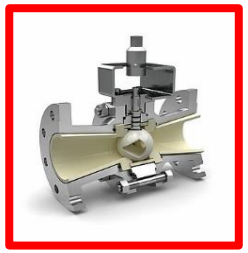
SAMSON AND EVERYTHING FLOWS



CERAVALVE

Hy4Smelt

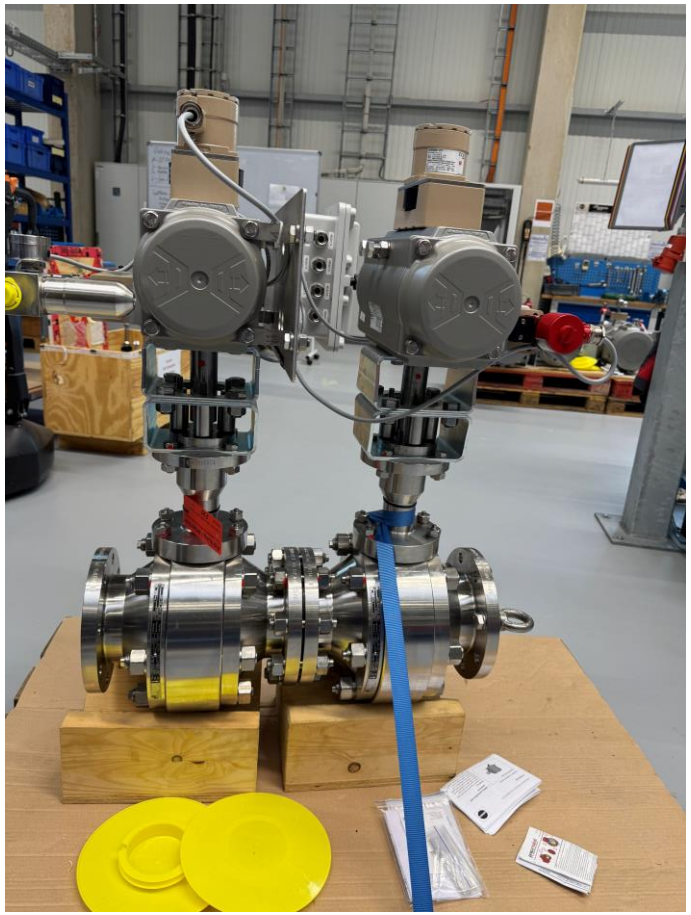


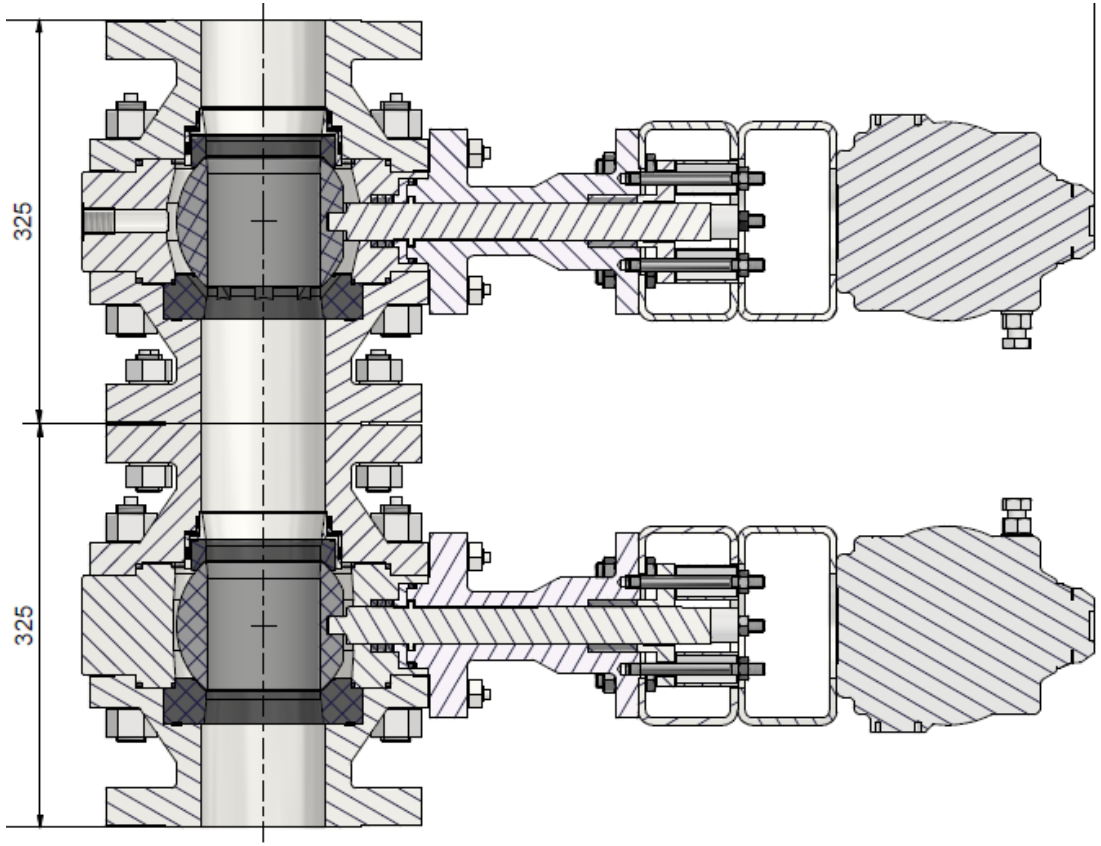
CERAVALVE

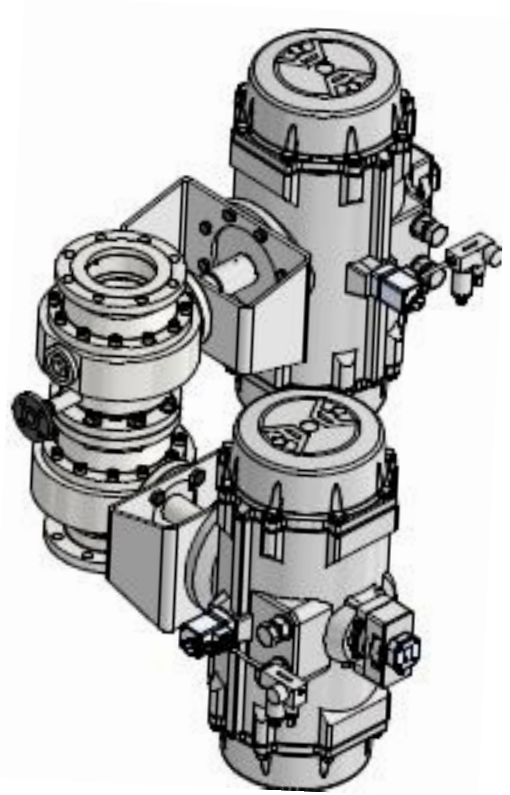
H2 FOR GREEN STEEL 3rd International Conference meets A CIRCULAR ECONOMY DRIVEN BY THE EUROPEAN STEEL



# APPLICATION: HDRI (HOT DIRECT REDUCED IRON ORE)





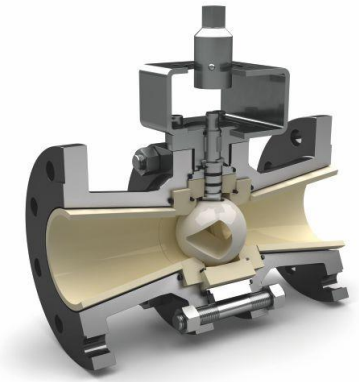



Ceramic isolation valves up to 850°C; HDRI
CERAVALVE KAL-XHT NPS4-4-4 150lbs
Body: 1.4876H, Ball: Si3N4, Seats SiC

# APPLICATION: LITHIUM

- Description
  - The extraction of lithium from minerals (pegmatite rocks) plays a minor role due to higher extraction costs. This could change in view of higher demand.
- Process data
  - Salt-Slurry + 20% soids, 1400 kg/m³ , 2 barg
- Solution
  - KSV
- Potential areas
  - CL, AU, AR, CN









# APPLICATION: LACTIC ACID

Corbian / Purac in RAYONG

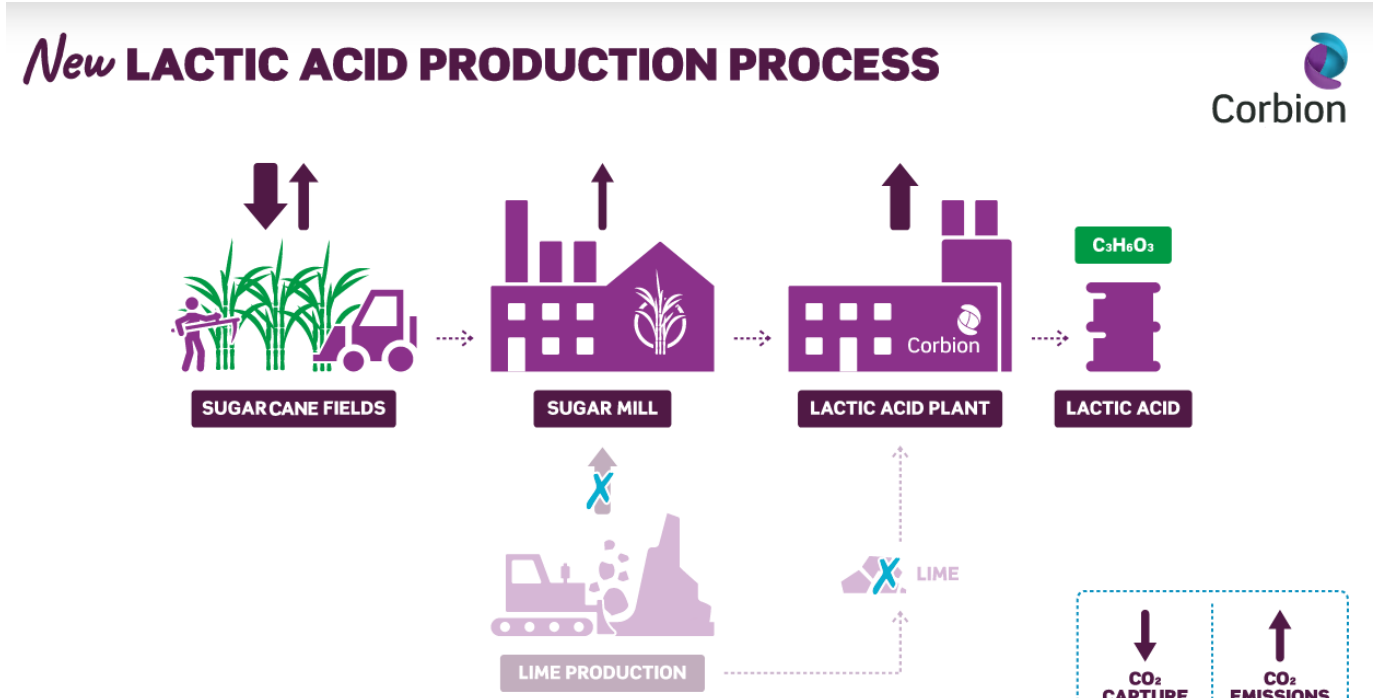
Project EAGLE in 2022:

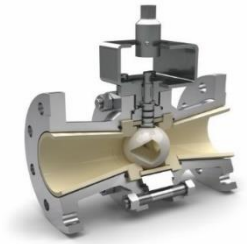
16 off CERAVALVE KST ctrl
04 off CERAVALVE KST on/off

Operating temp ranges 40-120°C, 1-4 barg.
Fluids: MgOH, $MgI_2$ slurry (solid crystals).

Competing initially with AZ plug ctrl valves

Main uses of lactic acid: PLA (poly-lactic acids), bio-degradable polymer (one-way PED bottles, packaging….), cosmetics, F&B industry, pharma…



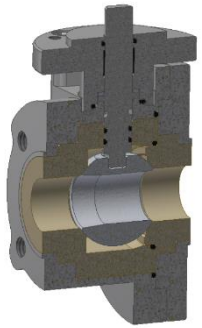



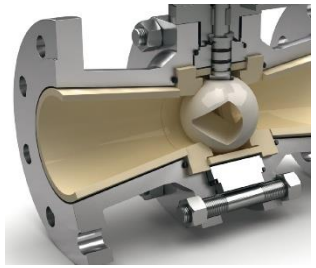
# APPLICATION: SUGAR OUT OF SUGAR BEET

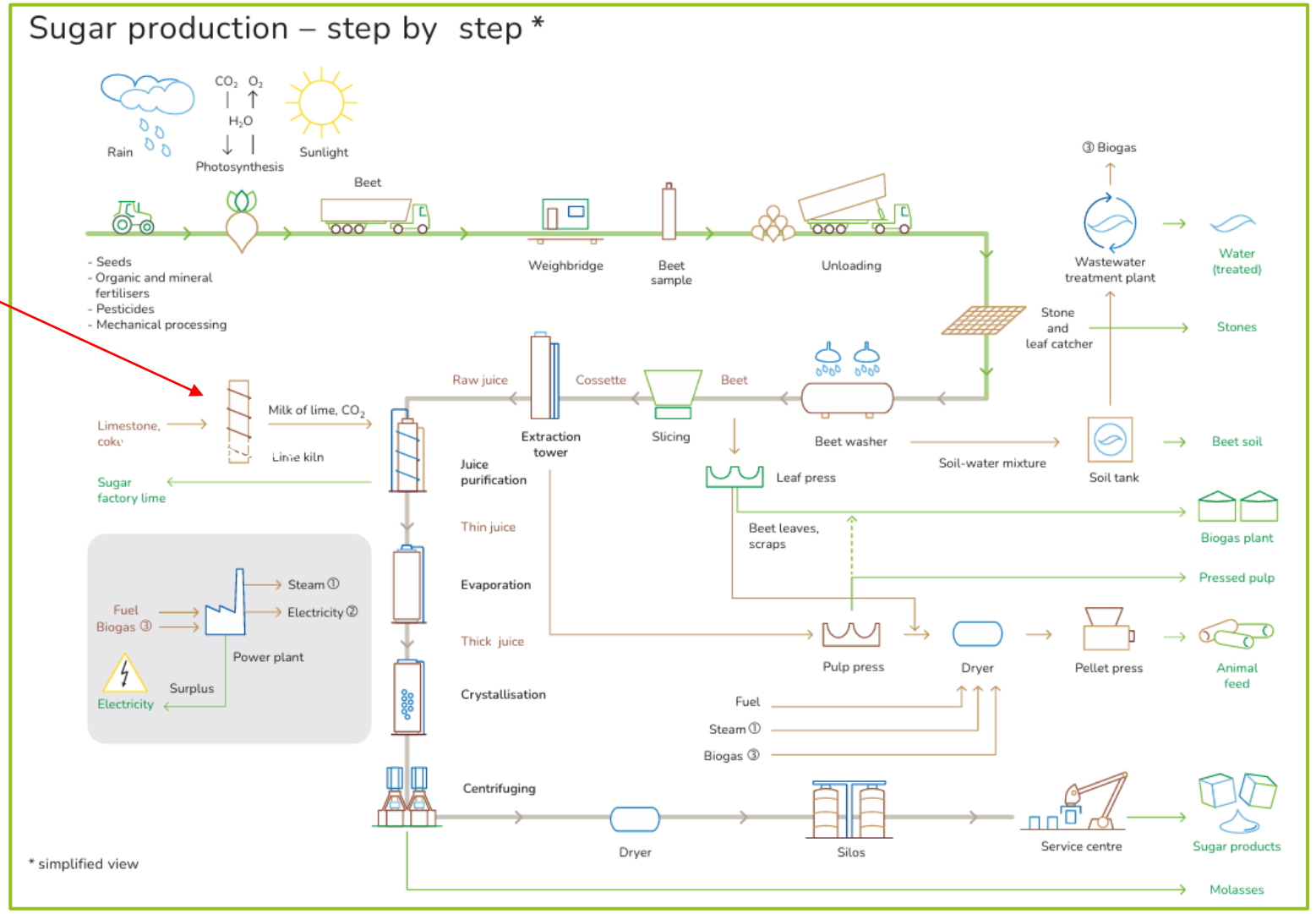
SAMSON AND EVERYTHING FLOWS

Area of application for Cera:

Juice purification and evaporation. The non-sugar substances in the raw juice are separated during juice purification with the help of calcium carbonate and carbon dioxide. After being filtered twice, a clear, pale-yellow clarified juice remains. In the evaporation station, water is extracted from the clarified juice in several stages until the sugar content reaches about 67% in the form of a thick juice.



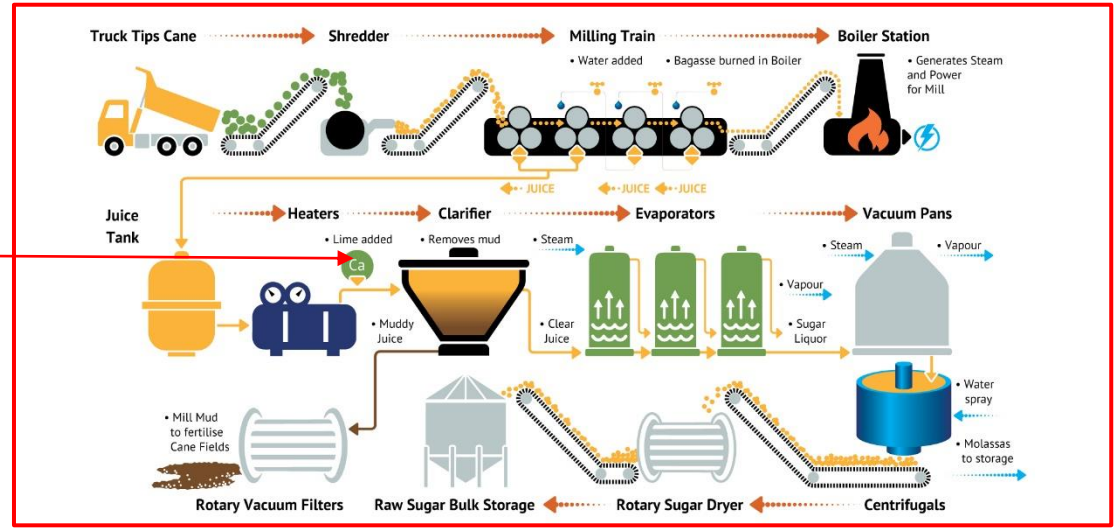


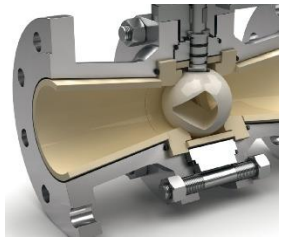


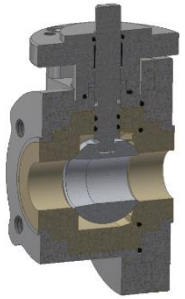
# APPLICATION: SUGAR OUT OF SUGARCANE

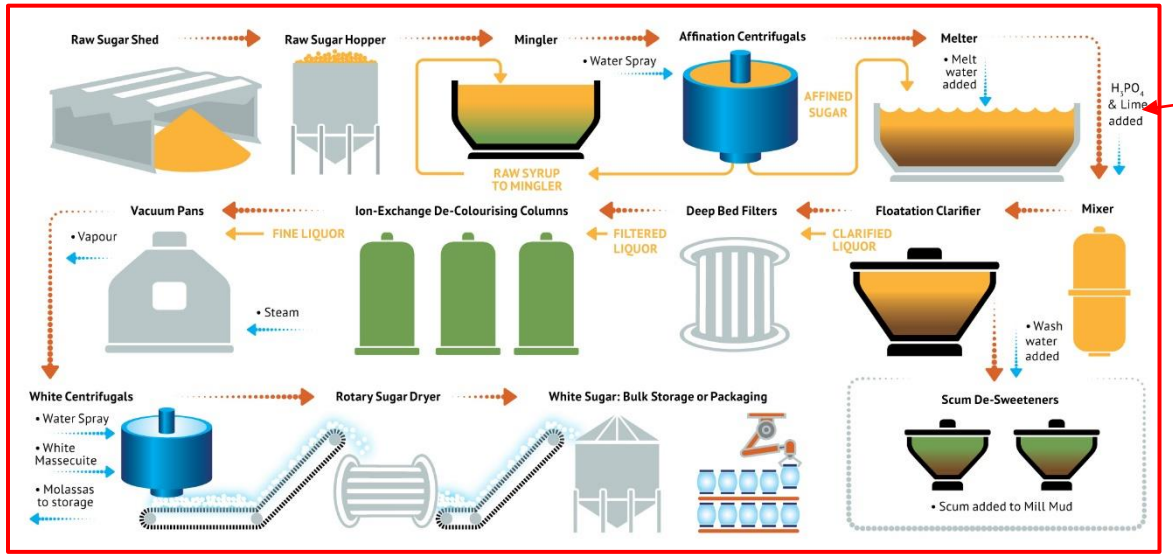
Area of application for Cera:

Raw Sugar production
Juice purification and evaporation. The non-sugar substances in the raw juice are separated during juice purification with the help of calcium carbonate and carbon dioxide.








Area of application for Cera:

Refining Sugar production
Additional purification of non-sugar substances in the raw sugar with the help of calcium carbonate and carbon dioxide.

# APPLICATION: WATER TREATMENT

Abrasive slurries (> 5% solids).

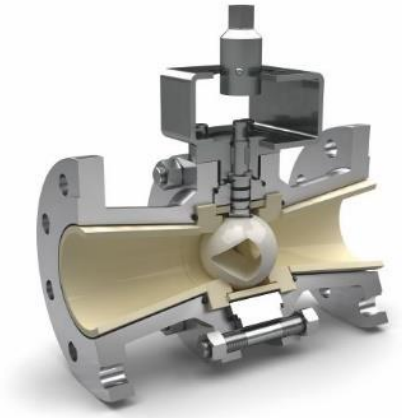
$CaCO_3$ – slurry, 30°C, 3-4barg used for pH – correction (app.7) in water treatment.

Typical sizes: DN15-DN50, PN10-40

CERAVALVE : KST



- Water treatment plant, THU DUC I, HCM, Vietnam,
- Water treatment plant,  THAN HIEP, HCM, Vietnam,
- Water treatment at pulp & paper mill HEINZEL PAPER, Austria,
- Water treatment plant, THU DUC III, HCM, Vietnam,
- Water treatment plant, City of Oslo, Norway
- Water treatment plant, for a salmon farm, Norway
- Water treatment plant PESSA, Germany
- Water treatment plant by KURITA (JPN) for ESCM, Dresden



# APPLICATIONS IN YOUR TERRITORY

- Please compare your market to above applications
- Identify new potential applications and share them with us
- Let’s not wait until potential applications come us….get going and hunt for them!

# OUR FOCUS APPLICATIONS LIE ON FLUIDS / MEDIAS

- Limestone slurry $CaCO_3$

FGD units of coal PP; pH – neutralisation in water treatment plants, wet -flue gas cleaning in waste incinerators…

- Other erosive & corrosive slurries

$TiCl_4$ slurry, $TiO_2$ slurry with $H_2SO_4$ , $H_3PO_4$ with gypsum solids, Ammonium nitrate ($NH_4NO_3$) slurry, Cu-tailings, Cu with $H_2SO_4$ suspension, Ni particles with $H_2SO_4$ , $FeCl_3$ .....

- Hot Reduced Iron Ore (HDRI) for steel manufacturing

HDRI powder 3-4barg, 700-800°C ventilation valves and isolation valves

- New opportunities ex. in seawater desalination plants

Reverse osmosis, can ceramic valves increase the service times ? Standard are Duplex materials.




AND
EVERYTHING
FLOWS

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