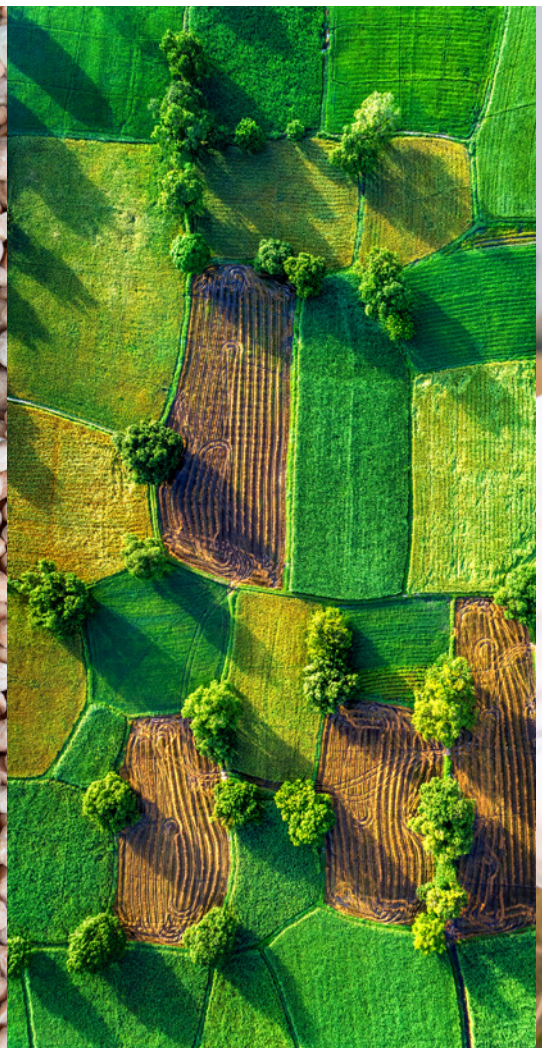
SULZER

Committed to excellence

Rotating equipment for the **phosphate, potash and NPK fertilizer production**



Meeting the challenge of feeding the world

As the global population grows, so does the need for more food of increasingly better quality. But depletion of soil, scarcity and limited availability of agricultural soils and fresh water, and protection of soils, ground waters and rivers against pollution result in an urgent need for more efficient fertilizer production and use. At Sulzer, we are committed to providing you with the best available technologies and fully dedicated support to help you solve the challenge of feeding and protecting the world, wherever you are.

Proven fertilizer know-how and expertise

As a leader in rotating equipment for the fertilizers manufacturing industry, Sulzer offers proven solutions for all stages of the production cycle – from ore mining to product refinement and finishing. Sulzer is committed to providing the best available technologies and dedicated support system to our customers, so they can concentrate on their core business – producing high-quality fertilizers.

Complete range of products

- Our pumping solutions include a complete range of roto-dynamic pumps, agitators, mixers, compressors and liquid ring vacuum pumps.
- We constantly improve the design of our product range to meet our customers' needs.

Built to last

- Erosive, abrasive, and corrosive wear are challenges that we deal with on a regular basis.
- Our product range features specific designs and materials of construction. It is developed to maximize the operating lifetime of the equipment under tough conditions.

Well-performing and reliable equipment

- We work closely with our customers to develop and design optimum solutions, taking into account their particular needs.
- We manufacture heavy-duty pumps and agitators developed through in-depth knowledge of our customers' processes to ensure maximum productivity.

Focus on efficiency and digitalization

- We contribute significantly to improving the efficiency of our customer's processes with our cutting-edge product range.
- We are in tune with tomorrow – supporting digitalization with our Sulzer Sense condition monitoring solution.

Deep commitment to sustainability

Leading fertilizer producers are continuously working on reducing their carbon footprint and preserving natural resources. Sulzer's dedicated product range, configured equipment and solid experience support this challenging aspiration.

Water and wastewater treatment

- We have decades of experience in water and wastewater treatment applications.
- We offer a complete range of state-of-the-art equipment for this industry, where efficiency is a top priority.

Towards a circular economy

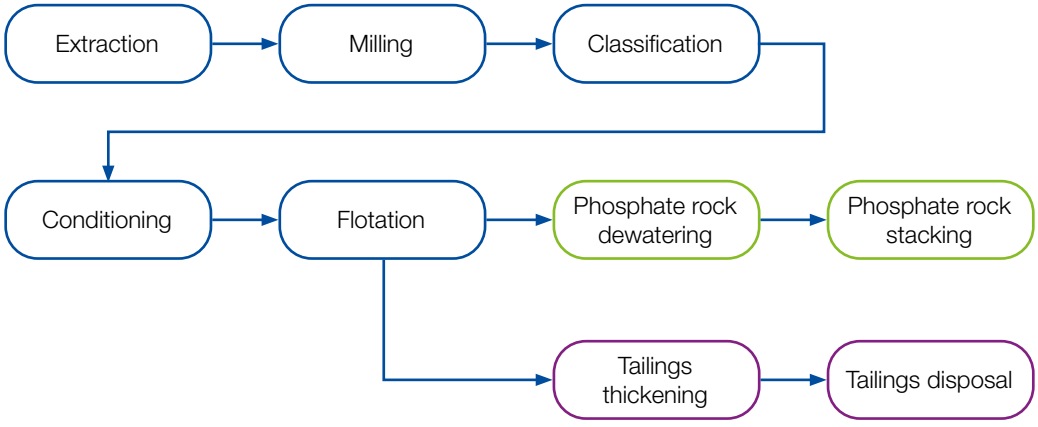
- Repairable and recyclable equipment.
- We are fully committed to providing you with the most feasible modular equipment in order to limit spare parts consumption and inventory.
- We offer second-hand equipment whenever possible.

Phosphate rock mining and beneficiation

Phosphate ore contains the phosphorus (P) that is needed to produce the difference grades of phosphoric acid and phosphate fertilizers. From mining to wet-beneficiation, the phosphate ore undergoes various operations to meet the required quality of phosphate rock needed by the phosphate fertilizer industry.

Erosion wear is the main concern for the pumps, agitators and mixers used in slurry applications. The addition of air in the flotation unit is an additional challenge for pumps. Fluids may also be corrosive due to the presence of additives that reduce the pH level. For less demanding applications, various pumps are required for the transportation of process water and chemicals.

Basic block diagram of flotation-beneficiation of phosphate rock



Our technical solutions

Through our worldwide installed base of equipment, we have been providing solutions for the phosphate rock beneficiation process for decades. Backed by this experience and proven solutions in other metals and mining processes, Sulzer is able to provide you with slurry, mine dewatering and process pumps and heavy-duty agitators meeting the process needs. The complete product offering includes all fluid and pressurized air management applications with high-efficiency centrifugal blowers and compressors, as well as liquid ring vacuum pumps.

Core applications in phosphate rock mining and beneficiation

Extraction (mining)

- HP water pump
- Slurry pump
- Tank agitator/mixer

Milling – Classification

- Feed water pump
- Mill discharge pump
- Cyclone feed/UF/OF pump
- Attrition feed/discharge pump

Condition – Flotation

- Conditioner agitator/mixer
- Flotation feed/recirculation/underflow/overflow pump
- Flotation air injection fan/blower

Phosphate rock / tailings dewatering – Tailings disposal

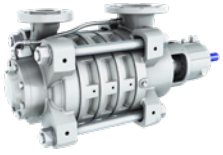
- Phosphate rock hydro-transport pump
- Tailings transfer pump
- Thickener feed/underflow/overflow pump
- Filter feed/wash pump
- Filter vacuum pump
- Tank agitator

Other applications

- Dewatering
- Water intake
- Water transfer/supply
- Process water
- Tailings ponds and water reclamation
- Water and wastewater treatment

Single-stage process pumps

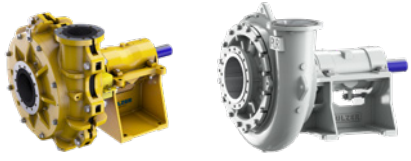
Multi-stage pumps



Vertical pumps

Agitators

Single-stage slurry pumps



Compressors

Phosphate rock mining and beneficiation product portfolio

Pump type	**Model**	**Fluid properties**				
		Water[1]	Chemicals	Light abrasion	Medium abrasion	Heavy abrasion
Horizontal overhung pumps	SNS	●				
(process and slurry pumps)	CPE	●	●			
	AHLSTAR A	●	●			
	AHLSTAR WPP			● [2]		
	PLR				● [2]	
	EMW					● [2]
Vertical cantilever sump pumps[3]	VA	●	●	●	●	●
Vertical line shaft sump pumps[3]	VM	●	●	●	●	●
Horizontal multi-stage pumps	MBN	●				
Horizontal axially split pumps	MSD / ZPP / SMD	●				

Agitator/mixer type	**Model**	**Fluid properties**				
		Water[1]	Chemicals	Light abrasion	Medium abrasion	Heavy abrasion
Vertical agitators/mixers	SALOMIX™ / Scaba	●	●	●	●	●

Vacuum pump type	**Model**	**Fluid properties**				
		Gas[4]	Water [5]			
Liquid ring vacuum pumps	VRN	●	●			

Compressor type	**Model**	**Fluid properties**				
		Air				
Centrifugal fans/ compressors	HST	●				
Centrifugal blowers/ compressors	HSR	●				

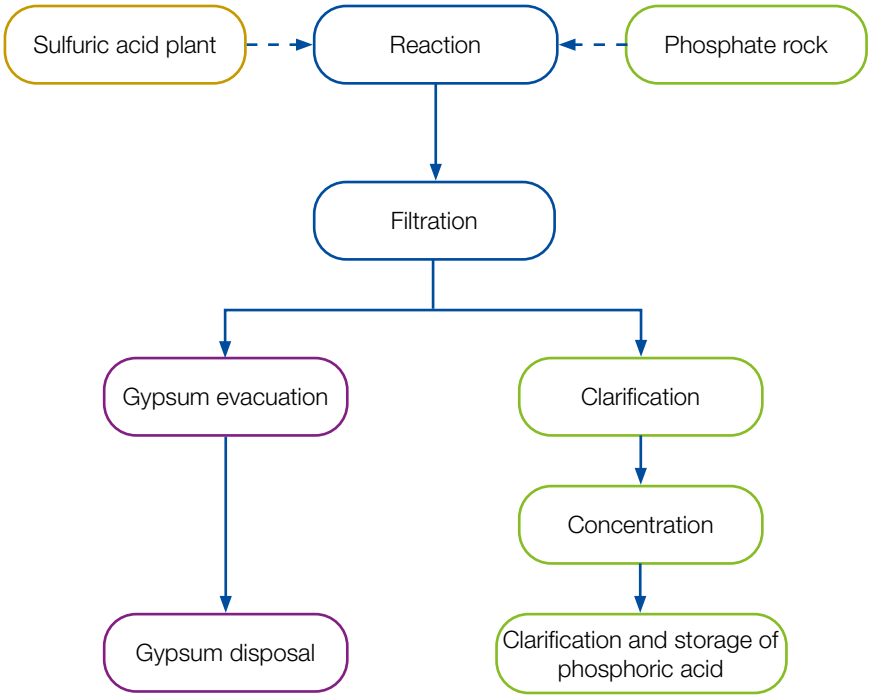
[1] Water can be corrosive depending essentially on acidity (pH) and chloride content.
[2] Fluid may be aerated or contain gas.
[3] Hydraulic parts from horizontal overhung pumps.
[4] Water-saturated air.
[5] Water used for liquid ring.

Phosphoric acid (WPA) production

Most phosphoric acid is produced via an attack of phosphate rock by sulfuric acid. There are several processes and technologies, but we can identify three main steps in the production process with each having specificities: reaction, filtration and concentration.

One of the main criteria affecting the severity of the applications is the quality of the phosphate rock, but erosion and corrosion also depend on the production process used (e.g. dihydrate vs. hemihydrate), technology and operation. The equipment needs to be robust and reliable in order to perform as required under all circumstances.

Basic block diagram of WPA production



Our technical solutions

With proven experience and worldwide references on most production processes and technologies, we offer an extensive range of products suitable for all applications in phosacid plants: wear-resistant and slurry pumps, heavy-duty horizontal and vertical axial flow pumps, single-stage and multi-stage process pumps, liquid ring vacuum pumps, standard and heavy-duty agitators, as well as many sealing systems and remote monitoring devices.

Core applications in phosphoric acid production

Attack – Reaction

- Sulfuric acid pump
- Phosphate rock agitator
- Phosphate rock feed pump
- Cooler circulation pump
- Reactor/digestor agitator
- Reactor circulation pump (internal/external installation)
- Cooler vacuum pump
- Slurry filter feed pump

Filtration – Clarification – Gypsum evacuation

- Filtrate pumps (with/without self-regulating design)
- Cake/cloth wash pump
- Gypsum slurry pump
- Filter vacuum pump
- Tank agitator/mixer
- Weak acid sludge pump

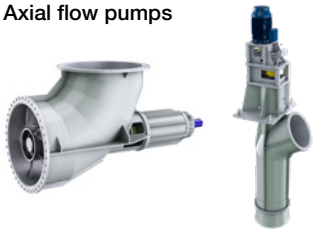
Concentration – Clarification and storage

- Evaporator feed pump
- Evaporator circulation pump
- Product acid pump
- Evaporator vacuum pump
- Hotwell pump
- Tank agitator/mixer
- Product acid sludge pump

Other applications (illustrative)

- Scrubbers circulation
- Sumps and effluents
- Water intake unit
- Water transfer/supply facility
- Water and wastewater treatment unit
- Cooling water unit
- Boiler unit
- Molten sulphur and sulphuric acid plant

Axial flow pumps

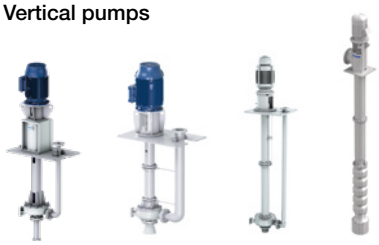


Single-stage slurry pumps

Single-stage process pumps

Multi-stage and axially split pumps

Vertical pumps



Agitators and circulators

Liquid ring vacuum pumps

Phosphoric acid product portfolio

Pump type	Model	Fluid properties				
		Water[1]	Chemicals	Mainly abrasive[2]	Erosive-corrosive	Mainly corrosive
Horizontal overhung pumps	SNS	●				
(process and slurry pumps)	CPE	●	●			●
	AHLSTAR A	●	●		●	●
	AHLSTAR WPP				●	
	PLR				●	
	EMW			●		
Vertical cantilever sump pumps[4]	VA	●	●	●	●	●
Vertical line shaft sump pumps[4]	VM	●	●	●	●	●
Horizontal multi-stage pumps	MBN	●				
Horizontal axially split pumps	SMD / ZPP / SMD	●				
Vertical turbine pumps	SJT/ JTS	●				
Horizontal / vertical axial flow pumps	CAHR CAHR-V				●	●

Agitator/mixer type	Model	Fluid properties				
		Water[1]	Chemicals	Mainly abrasive[2]	Erosive-corrosive	Mainly corrosive
Vertical agitators / mixers	SALOMIX™ / Scaba	●	●	●	●	●
Reactor vertical propeller circulator	CAV(L)				●	

Vacuum pump type	Model	Fluid properties	
		Water[1]	Gas
Liquid ring vacuum pumps	VRN	● [8]	● [7]

[1] Water can be corrosive depending essentially on acidity (pH) and chloride content.

[2] A purely erosive application like phosphate rock pumping may also be slightly corrosive due to acidity (pH) and chloride content of the water.

[4] Hydraulic parts from horizontal overhung pumps.

[7] Water saturated air

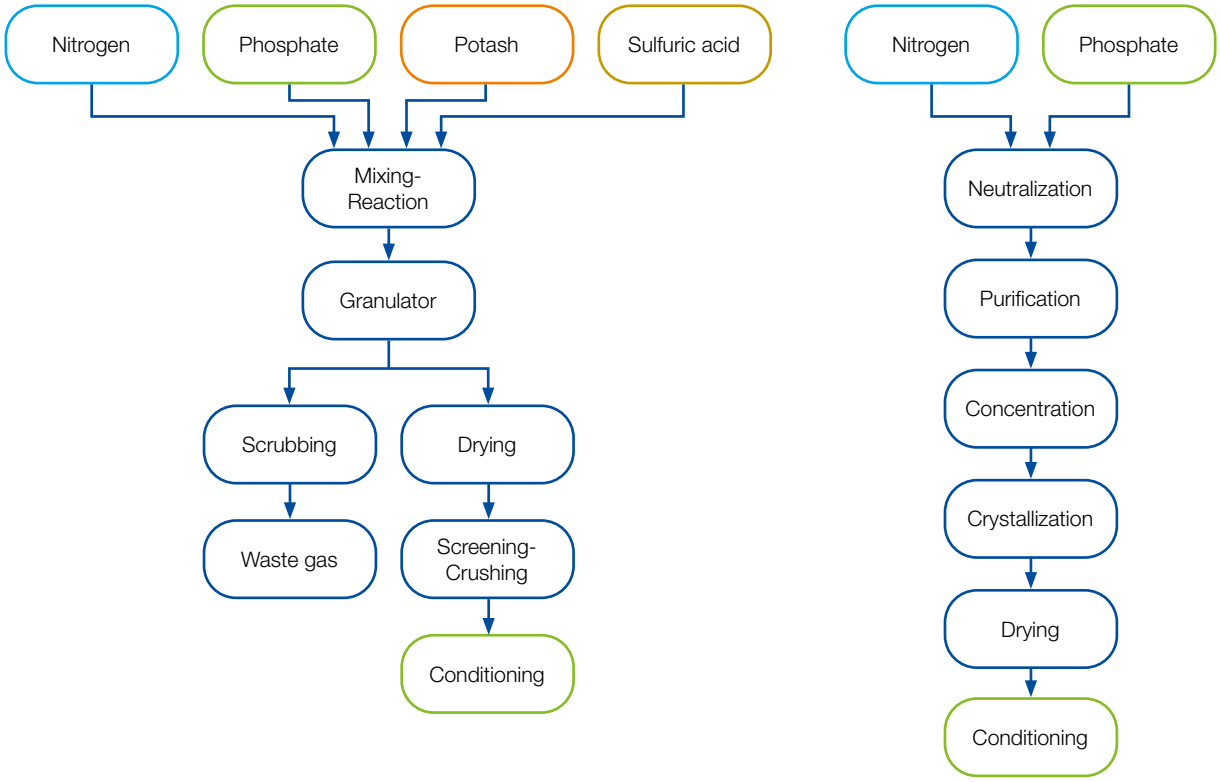
[8] Water used for liquid ring

Single phosphate and multinutrient fertilizers

There is an almost infinite range of single and multi-nutrient fertilizers utilizing various production processes. In some cases, very basic attack-reaction and granulation technology can be used, while in other cases the reaction will require a pre-neutralizer tank, a pipe reactor and a dryer pipe, and even evaporation-crystallization technologies.

The parameters will thus considerably vary between the various processes and technologies, as will the needed equipment. Amongst the parameters to be considered, we have the quality of the feedstocks, type of chemicals, erosive properties of the solids, operating temperature, aeration, viscosity, and tendency of the mixture to crystallize and agglomerate.

Basic block diagrams of possible NP(K) fertilizer manufacture



Our technical solutions

Our complete range of pumps, agitators and mixers allows us to select the best design according to the characteristics of the fluid and the operating parameters: slurry pumps, process pumps, vertical ammonia pumps (API design), heavy-duty axial flow pumps, agitators, mixers and vertical propeller circulators used in crystallizers. For fluids requiring heating, our dedicated pumps can be fitted with a heating jacket. Additional features for the sealing system may be included like expeller with packing ring, hydrodynamic sealing with flying wheel, or single or double mechanical seals.

Core applications in single phosphate and multinutrient fertilizers

SSP/TSP/MAP/DAP/NPK (granules/prills)

- Sulphuric acid pump
- Phosphoric acid pump
- Ammonia pump
- Nitric acid feed pump
- Reactor/digestor agitator
- Mixing/melting tank agitator
- Crystallizer/evaporator feed pump
- Crystallizer/evaporator agitator
- Granulator feed pump
- Scrubber pre-scrubber circulation pumps
- Pipe reactor pump
- Slurry pump
- Spherodizer/prilling tower/granulation feed pump
- Dissolution/melting/mixing/ preneutralizer/neutralizer/equalization/ reactor tank agitator
- Sump and waste tank agitator

DAP/MKP/PK (water soluble fertilizer)

- Ammonia pump
- Phosphoric acid pump
- Mixing tank agitators
- Gypsum pump
- Reactor feed pump
- Evaporator/crystallizer vacuum pump
- Evaporator/crystallizer circulation pump
- Product extraction pump
- Mother liquor pump
- Sump and waste tank agitator
- Scrubber pump

Other applications (illustrative)

- Water intake
- Water transfer/supply
- Additives and chemical pumps
- Cooling and process water
- Water and wastewater treatment
- Boiler unit

Axial flow pumps

Agitators

Vertical pumps



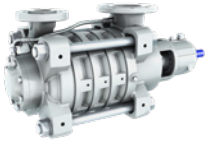


Single-stage process pumps




Slurry pumps


Multi-stage pumps



Liquid ring vacuum pumps and compressors


Single phosphate and multinutrient fertilizers product portfolio

Pump type	Model	Fluid properties				
		Water[1]	Chemicals	Ammonia	Corrosive	Erosive-corrosive
Horizontal overhung pumps	SNS	●				
(process and slurry pumps)	CPE	●	●		●	
	AHLSTAR A	●	●		●	
	AHLSTAR WPP					●
	PLR					●
	EMW					●
	PRE			●		
Vertical cantilever sump pumps[3]	VA	●	●		●	●
Vertical line shaft sump pumps[3]	VM	●	●		●	●
Horizontal multi-stage pumps	MBN	●				
Vertical turbine pumps	SJT/ JTS	●				
	SJD			●		
Horizontal axial flow pumps	CAHR				●	●

Agitator/mixer type	Model	Fluid properties				
		Water[1]	Chemicals		Corrosive	Erosive-corrosive
Vertical top-mounted agitators/mixers	SALOMIX™ / Scaba	●	●		●	●

Vacuum pump type	Model	Fluid properties	
		Gas[4]	Water[5]
Liquid ring vacuum pumps	VRN	●	●

[1] Water can be corrosive depending essentially on acidity (pH) and chloride content.

[3] Hydraulic parts from horizontal overhung pumps.

[4] Water-saturated air.

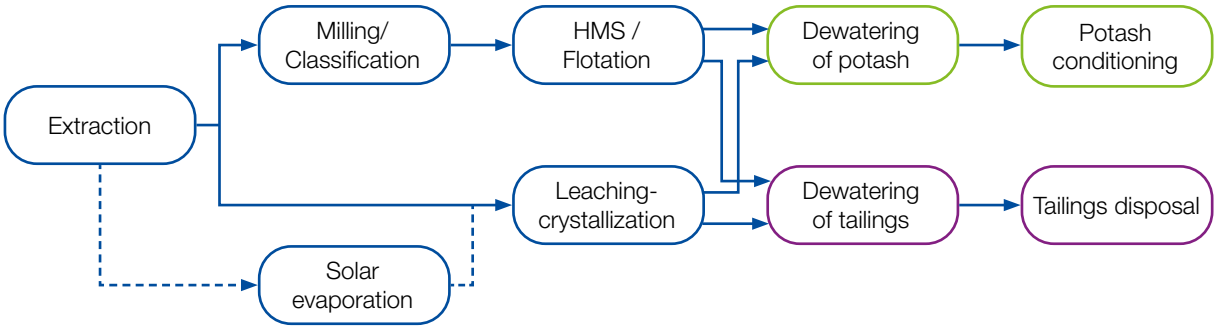
[5] Water used for liquid ring.

Potash fertilizer

The primary macronutrient potassium (K) is found in deposits that can be liquid, solid, underground or at surface level. Various mining, extraction and processing techniques exist for converting raw potash into high-quality potash fertilizers.

In flotation, erosion prevails with very severe demanding operating conditions for main slurry applications (e.g. potash slurry and tailings). In leaching-crystallization, corrosion is more intense, especially for the key equipment (e.g. circulation pumps, vertical propeller agitators). This is why the range of rotating equipment with suitable materials of constructions is very wide.

Basic block diagram of potash fertilizer production



Our technical solutions

For extraction of liquid solid deposits as well as brines disposal, we have a full range of vertical and horizontal pumps for either high-flow or very high-head applications. We also have a complete range of pumps, agitators and mixers to be used in processes based on heavy media separation and flotation-beneficiation activities. For the latter, our high-efficiency centrifugal blowers and compressors are completing our product portfolio.

For leaching-crystallization processes, we offer an extensive range of pumps for all types of pumping, agitation, and mixing applications. These include single-stage and multi-stage process pumps (horizontal or vertical design), heavy-slurry pumps, axial flow pumps, vertical agitators, and vertical propeller circulators. Our liquid ring vacuum pumps are also suitable for the extraction of water-saturated gas in a vacuum loop and for vacuum filtration.

Core applications in the mining, extraction and processing of potash

Extraction (mining) – Solar ponds evaporation

- Brine injection pump (In-Situ Leaching)
- Brine/seawater intake pump
- Ponds transfer pump
- Tank agitation

Flotation and heavy media separation (HMS)

- Mill discharge pump
- Hydrocyclone feed/OF/UF pump
- Conditioner agitator/mixer
- Flotation cell/column feed/ recirculation/OF/UF pump
- Thickener feed/OF/UF pump
- Flotation cell/column fan/blower
- Tank agitator/mixer

Leaching-crystallization

- Mother liquor pump
- Crystallizer/evaporator feed pump
- Product/mash extraction pump
- Crystallizer/evaporator circulation pump
- Vertical propeller circulator/agitator (bottom/top mounted)
- Tank agitator/mixer

Dewatering

- Centrifugal pump
- Filter feed pump
- Cloth wash pump
- High-pressure water pump
- Filter vacuum pump

Tailings disposal

- Deep-well injection pump
- Mine back-filling pump (excl. paste filling)
- Tank agitation and mixing

Other applications (illustrative)

- Dewatering
- Water intake
- Water transfer/supply
- Additives and chemical pumps
- Cooling and process water
- Tailings ponds and water reclamation
- Water and wastewater treatment
- Boiler unit

Axial flow pumps

Agitators

Vertical pumps

Single-stage process pumps

Slurry pumps

Multi-stage and axially split pumps

Liquid ring vacuum pumps and compressors

Potash fertilizers product portfolio

Pump type	Model	Fluid properties				
		Water[1]	Chemicals	Mainly abrasive	Erosive-corrosive	Mainly corrosive[2]
Horizontal overhung pumps	SNS	●				
(Process and slurry pumps)	CPE	●	●			●
	AHLSTAR A	●	●			●
	AHLSTAR WPP				●	
	PLR			●	●	
	EMW			●		
Vertical cantilever sump pumps[3]	VA	●	●	●	●	●
Vertical line shaft sump pumps[3]	VM	●	●	●	●	●
Multi-stage pumps	MBN / MC / MD	●				●
Horizontal axially split pumps	SMD / ZPP / MSD	●				●
Vertical turbine pumps	SJP / SJM / SJT / JTS	●				●
Horizontal axial flow pumps	CAHR	●		●	●	●

Agitator/mixer type	Model	Fluid properties				
		Water[1]	Chemicals	Mainly abrasive	Erosive-corrosive	Mainly corrosive
Vertical top-mounted agitators/mixers	SALOMIX™ / Scaba	●	●	●	●	●

Vacuum pump type	Model	Fluid properties	
		Gas[4]	Water[5]
Liquid ring vacuum pumps	VRN	●	●

Compressor type	Model	Fluid properties
		Air
Centrifugal fans/ compressors	HST	●
Centrifugal blowers/ compressors	HSR	●

[1] Water, cooling and process can be corrosive depending essentially on pH and chloride content

[2] Including brines

[3] Hydraulic parts from horizontal overhung pumps.

[4] Water-saturated air

[5] Water used for liquid ring

Fertilizer plants:
design and consultancy services

Licensors

Licensor partnerships are important to us. We collaborate closely with our licensors to develop and supply the equipment they need. For example, we collaborate to test and improve new technology, including the construction materials of plant components. We are committed to developing state-of-the-art, innovative, and tailor-made equipment for our licensors.

OEMs

Supply, installation and commissioning of rotating equipment are a frequent requirements from end-users and engineering companies. You can always count on Sulzer to successfully deliver whatever you need. If you have any specific need, please do not hesitate to contact us.

Engineering companies

We are available to discuss all aspects of rotating equipment needs from project feasibility to detailed engineering, design of greenfield to brownfield upgrades and from commissioning and process adjustment to plant acceptance tests. As your long-term partners, we want to be present and support you through all your challenges.

As your long-term partners, we are with you at every step of your rotating equipment journey. We are always happy to discuss and advise on project feasibility, detailed engineering and design, greenfield and brownfield upgrades, commissioning, process adjustments, plant acceptance tests and more with you.

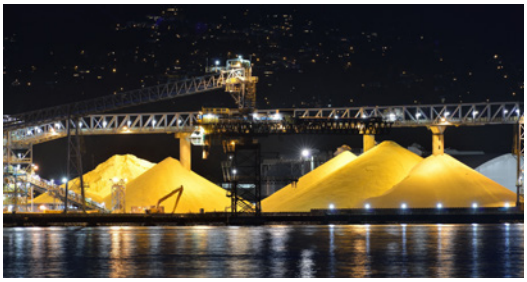
Fertilizer plants:
connected and auxiliary applications

Pumping and mixing solutions for mine water management

Comprehensive portfolio of pumps and process equipment for abrasive and corrosive environments.

Molten sulfur and sulfuric acid

Complete range of pumps and agitators to meet all the needs of this demanding industry. From dirty molten sulphur to hot concentrated sulphuric acid.



Industrial water treatment

Extensive coverage of energy-efficient and reliable pumping, mixing, and aeration solutions for all industrial water treatment processes.

Water intake, transport and irrigation

Various reliable pumping solutions for water intake, water transportation, industrial water supply, distribution and irrigation.

Digital solutions

Sense condition monitoring solution detects possible equipment failures early on and optimizes maintenance planning. The data can be easily viewed on a laptop, tablet or smartphone.

A complete solution provider

Single-stage pumps

AHLSTAR A, APP/T process pumps

AHLSTAR NPP/T pumps

WPP/T wear-resistant pumps

SIL inline pumps

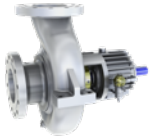
Single-stage pumps

SNS process pumps

CPE ANSI process pumps

NRN high-pressure process pumps

PRE(R), OHH high-pressure API pumps



Axially split pumps

SMD/SMH/ZPP axially split pumps

MSD axially split pumps

Vertical pumps

VA, VAP sump pumps

VM line shaft pumps

SJP vertical propeller pumps

SJM/SJT, JTS vertical pumps

Submersible pumps

VEY, VNY molten salt pumps

VAS sulfuric acid pumps

VSF, VLSF, OCVSF molten sulfur pumps

SJD vertical multistage can pump

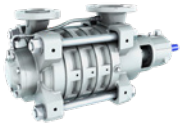
Axial flow pumps

CAHR axial flow pumps

CAHR-V vertical axial flow pumps

Ring section pumps

MBN, MC/MD high-pressure pumps



Agitators and circulators

SALOMIX™ side-mounted agitators

SALOMIX™ and Scaba top-mounted agitators

CAV vertical propeller circulators

Slurry pumps

EMW slurry pumps

PLR slurry pumps

Submersible dewatering pumps

Submersible pumps type ABS XFP, AFLX, VUPX

Submersible drainage pumps J, JC, XJ ranges

Submersible sludge pumps XJS, JS ranges

Vacuum pumps and compressors

VRN liquid ring vacuum pumps

HST™ and HSR turbocompressor

Digital solutions

Sulzer Sense condition monitoring

Standard materials of constructions

	Internal code		Specification	Comparable grades		Nominal chemical composition					
	MCN	Alternative codes	Standard grade or other description	Wrought	Cast EN	C	Cr	Ni	Mo	Cu	N
Corrosion-resistant cast steels											
Martensitic cast steels	J0263	E2 / S5M	ASTM A743 CA-6NM		1.4317	max. 0.06	11.5-14.0	3.5-4.5	0.40-1.0		
	J0264	4E	ASTM A747 CB-7Cu-2 (H900)	15-5 PH	1.4525	max. 0.07	14.0-15.5	4.5-5.5		2.5-3.2	
Austenitic cast steels	J0299	4C	ASTM A743 Grade CF-8	AISI 304	1.4308	max. 0.08	18.0-21.0	8.0-11.0			
	J0268	42	ASTM A743 Grade CF-8M	AISI 316	1.4408	max. 0.08	18.0-21.0	9.0-12.0	2.0-3.0		
	J0553	I6M	ASTM A351 CF-3M	AISI 316L	1.4409	max. 0.03	17.0-21.0	9.0-13.0	2.0-3.0		
	J0853	UBM	EN 10283 1.4584	904L	1.4584	max. 0.025	19.00-21.00	24.00-26.00	4.00-5.00	1.00-3.00	
	J0270	43	ASTM A743 Grade CN-7M	Alloy 20	1.4527	max. 0.07	19.0-22.0	27.5-30.5	2.0-3.0	3.0-4.0	
	J0859	A31	Alloy 31	Alloy 31	(1.4562)	max. 0.025	26.0-28.0	30.0-32.0	6.0-7.0	1.0-1.4	0.15-0.25
	J0271	4U [2]	654SMO	654SMO (UNS S32654)		max. 0.025	23.0-25.0	21.0-23.0	7.1-7.5	0.3-0.7	0.40-0.55
Austenitic-ferritic duplex steels	J0265	41	ASTM A890 Grade 3A		(1.4468)	max. 0.06	24.0-27.0	4.0-6.0	1.75-2.5		0.15-0.25
	J0266	4L / U55	ASTM A890 Grade 1B		(1.4517)	max. 0.04	24.5-26.5	4.7-6.0	1.7-2.3	2.7-3.3	0.10-0.25
Super duplex steels	J0267	4T / P5M [3]	ASTM A890 Grade 5A	EN 1.4410	1.4469	max. 0.03	24.0-26.0	6.0-8.0	4.0-5.0		0.10-0.30
Ferritic stainless steel	J0840	ER [4]	ASTM A743 CC50 (Mod)			0.25-0.35	29.0-30.0	1.50-3.00	1.50-3.00	1.00-1.50	0.10-0.20
Carbon and low alloy cast steels											
Carbon steels	J0297	46	ASTM A216 Grade WCB		(1.0619)	max. 0.30	max. 0.50	max. 0.50	max. 0.20	max. 0.30	
Cast irons											
Grey cast irons	F0067	53 / F25	ASTM A48 Class No 35 B		EN-GJL-250						
Ductile cast irons	F0047	5H	ASTM A395 Grade 60-40-18		EN-GJS-400-18	min. 3.00					
Wear and corrosion resistant cast irons	F0068	5B	ASTM A532 III A level 1		(5.5610)	2.0-3.3	23.0-30.0	max. 2.5	max. 3.0	max. 1.2	
	F0207	EXR	ASTM A532 III A level 2		(5.5610)	2.0-3.3	23.0-30.0	max. 2.5	max. 3.0	max. 1.2	
	F0206	CB3	CB3			2.9-3.1	max 0.10	max 0.10		min 0.6	
	F0204	CRM	30Cr/Mo		(1.4138)	0.9-1.1	29.0-31.0	max 0.4	1.9-2.2		
	F0205	FC1	38Cr/5Ni/2Mo/1Cu			1.5-1.8	36-39	4.5-5.5	2.0-2.5	1.0-1.5	
Cast titanium and nickel alloy											
Titanium	R0017	75	ASTM B367 C-3		3.7055						
Nickel alloys	N0103	4J	ASTM A494 Grade CW-6M	Hastelloy C		max. 0.07	17.0-20.0	balance	17.0-20.0		

[1] Hardness values in brackets are informative [2] Trademark by Outokumpu Oyj [3] PRE ≥ 40 [4] Chemical composition modified

	Guaranteed mechanical properties				Main products	General properties and examples of applications
Others	Tensile strength N/mm^2	Yield strength N/mm^2	Elonga-tion %	Hard-ness HBW (1		
Corrosion-resistant cast steels						
	755	550	15	(250)	CAHR	Air-hardening steel with good strength properties. Used e.g. in power industry applications.
Nb 0.15-0.35	1170	1000	5	min 375	AHLSTAR, CPE	A precipitation hardening corrosion resistant grade with good strength properties and wear resistance. Used for pump components.
	485	205	35	(150)	A, APP	Standard stainless steel grade with good toughness and resistance to nitric acid solutions.
	485	205	30	(150)	SNS	Molybdenum alloyed grade with better resistance to acids and pitting compared to CF-8.
	485	205	30	(150)	CAHR, VRN	Similar to the previous one (CF-8M). Low carbon improves corrosion resistance (limited intragranular corrosion) and weldability.
	450	185	30	(150)	CAHR	Austenitic stainless steel. Higher Nickel and Molybdenum compared to CF-3M improves global corrosion resistance. Good corrosion resistance to sulphuric acid or strong phosphoric acid even with chloride content. Copper content improves corrosion resistance in e.g. weak sulphuric acid solutions.
	425	170	35	(140)	CPE	A grade for castings where resistance to sulphuric acid is essential.
	600	240			CAHR	Super austenitic stainless steel with excellent resistance to corrosion (high Molybdenum) and erosion (high Chromium). Used in sulphuric acid and phosphoric acid (WPA) media even with solid and/or chloride content.
	600	350	35	(220)	AHLSTAR, CPT, KCE, SALOMIX	Excellent corrosion resistance. Nitrogen also gives very good resistance to pitting and crevice corrosion. Resistant to hot acids with high chloride content. Used in pulp bleaching plants, sea water applications, phosphoric acid (WPA), and in the handling of liquids containing halides.
	655	450	25	(230)	AHLSTAR, SNS, CPE, ZPP, KCE, MCE, SX, SALOMIX	Steel with better tensile and yield strength compared to austenitic steels. Used for various process industry and seawater applications and chloride-containing solutions.
	690	485	16	(250)	AHLSTAR, CPT, CAHR, EMTECH, VRN	Similar grade to the previous one. The copper content improves corrosion resistance in e.g. weak sulphuric acid and phosphoric acid (WPA) and chloride-containing solutions. Molybdenum improves general corrosion resistance.
	690	515	18	(250)	AHLSTAR, CPE, ZPP, KCE, MCE, CAHR	Used for equipment in the chemical and pulp industries and chloride-containing solutions. Good resistance to sea water.
	380			(275)	AHLSTAR WPP	Corrosive WPA with solids in phosphate fertilizer industry. Also metal processing like Lx-Sx-Ew plants and other applications especially when a good corrosion-resistant and wear-resistant material is needed.
Mn 1.0 max. Si 0.6 max.	485-655	250	22	(160)		Ductile and strong weldable steel, used e.g. in pump support structures. Also used in hot water pumps.
	241			(210)	AHLSTAR APP, ZPP, EM-TECH, CAHR, EMW-R	Used in pump casings, casing covers and parts of bearings.
Si 2.50 max. P 0.08 max.	414	275	18	(150)	CPT	Used in casings and covers in various industries.
Si 1.5 max Mn 2.0 max				min 600	AHLSTAR WPP, PLR	High-chromium white cast iron for wear-resistant pumps. Corrosion resistant grade: well suited for wearing applications in alkaline and slightly acidic condition.
Si 1.5 max Mn 2.0 max				min 650	EMW-M	High-chromium white cast iron for wear-resistant pumps. Corrosion resistant grade: well suited for wearing applications in alkaline and slightly acidic condition. Erosion resistance increase with level 2.
Si 2.8-3.2 Mn 0.6-0.8	300			200-250	VAS	Acid-resistant cast iron used in high-concentration sulfuric acid production process (drying and absorption tower).
Si 2.0 max Mn 1.0 max				260-330	VAS, EMW-M, PLR	Corrosive WPA with solids in phosphate fertilizer industry and in high-concentration sulfuric acid. Also metal processing like Lx-Sx-Ew plants and other applications especially when a good corrosion-resistant and wear-resistant material is needed.
Si 1.5 max Mn 1.0 max				min 450	PLR, EMW-M	Corrosive WPA with solids in phosphate fertilizer industry. Also metal processing like Lx-Sx-Ew plants and other applications especially when good corrosion and wear resistant material is needed.
	450	380	12	max 235	AHLSTAR A, SX	Excellent corrosion resistance in many severe conditions, particularly ones containing chlorine, and in oxidizing conditions. Used in e.g. chlorine dioxide and hypochlorite-containing solutions in the pulp and paper and chemical process industry.
Fe max. 3.0%	495	275	25	min 180	SX	High Mo and Cr contents make the alloy suitable for reducing and oxidizing and otherwise severely corroding conditions. Good resistance to sulphuric acid, and also to hydrochloric acid up to concentrations of approx. 10%.

Proper maintenance drives cost savings and improves safety

When investing in process equipment, there is often a tendency to focus on the initial capital investment. The purchase price, however, is just a small part of the total life cycle cost for high-usage pumps, agitators and compressors. Obtaining optimum working life from your equipment requires regular and efficient servicing.

Reliability and safety

- Sulzer spare parts are specifically designed and engineered to fit your equipment
- Original spare parts ensure optimal performance and environmental and personal safety
- OEM service ensures top performance and safe operations
- Remote condition monitoring and on-site inspections keep your equipment in top shape and add peace of mind

Availability and responsiveness

- You can always rely on getting the right help quickly
- High spare part availability for all product types and generations in regional spare part centers maximizes your uptime
- Local presence with inventories customized to fit your equipment
- Wide service center footprint for workshop repairs and field-service means quick help if needed

Process knowledge

- Large knowledge base helps us recommend the optimal solution for your application requirements and maximize process performance
- Vast experience from light to extremely demanding process applications
- Large installed base with over 200’000 delivered equipment for industrial use
- Our specialists are always available to offer support and share their know-how
- Pumping process studies and troubleshooting offer valuable insights
- Upgrades and retrofitting further improve your process

Services and spare parts for process industry equipment

Spare parts

Sulzer has a worldwide network of spare part delivery centers to quickly deliver original spare parts from the stock or manufacture them promptly based on your order.

Field services

Our field services cover installation, start-up service, regular inspections, trouble-shooting, performance measurements, condition monitoring and more.

Service centers

We offer full service for your process equipment and spare parts availability for daily maintenance and repairs, process optimization and know-how, and complete energy audits.

Repairs

With our modern equipment and highly skilled personnel at our service centers we can repair and refurbish even the most demanding equipment back to its original performance. We also offer modernizations that enhance the performance or increase the lifetime of your equipment.

Process optimization and know-how

With Sulzer at your doorstep, you can improve your competitive advantage and ensure safe operation. Our partnership program offers you customized solutions for your process improvements and future applications.

Service contracts

If you need to free your own resources to other valuable tasks or if you want to save money by not keeping spare parts in your own stock, Sulzer can offer various service contract options for you.

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The Sulzer Flow division keeps your processes flowing. Wherever fluids are treated, pumped, or mixed, we deliver highly innovative and reliable solutions for the most demanding applications.

The Flow division specializes in pumping solutions specifically engineered for the processes of our customers. We provide pumps, agitators, compressors, grinders, screens and filters developed through intensive research and development in fluid dynamics and advanced materials. We are a market leader in pumping solutions for water, oil and gas, power, chemicals and most industrial segments.

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