



BUNGARTZ
CENTRIFUGAL PUMPS
CHALLENGING
APPLICATIONS

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Centrifugal Pumps at a Glance

PROBLEM-SOLVER.

APPLICATIONS THAT POSE A CHALLENGE.

For more than 75 years, pumps from Bungartz have been regarded as robust alternatives for applications that standard pumps cannot cope with. Our aim has always been to design each pump to be as reliable as possible and to meet individual customer requirements through innovation. Over time, this has resulted in a considerable portfolio of pumps and shaft sealing variants that offers the perfect solution to meet almost any application. This means, for example, that a pump with magnetic coupling also performs excellent for media containing solids and gas.

With media containing solids, it is possible to multiply the service life: by using harder materials or additional anti-wear linings.

The self-regulating pumps from Bungartz are so intelligently designed that the enormous complexity of an entire pump system can be simplified significantly. In many cases, it is even possible to save on sensors for control and regulation as well as instruments for dry-running protection.

The following are numerous application examples in which Bungartz pumps have been operating successfully. There are many ways to perfectly solve process engineering tasks. Standard pumps just can't keep up. Customers should therefore bring Bungartz's experts on board as early as possible to ensure the best possible end result.

TYPICAL EXAMPLES.

- Savings on tanks and piping
- Reduction of the error rate
- Elimination of unnecessary measurement equipment
- Reduction of the construction heights
- Avoidance of pits

Determining the right pump is a real challenge. First of all, the pumped medium must be dealt with on all fronts. Factors such as solids, corrosivity, boiling states, gas contents, ATEX zones and Technical Instructions on Air Quality Control (TA-Luft) are key factors here.

After that, the installation must be considered. Suction head and monitoring must be minimized. Yet safety must not fall by the wayside.

The encouraging thing: Bungartz manages to meet all these requirements perfectly with the right pump. As a result, the system functions with maximum simplicity, yet with absolute operational reliability.

PUMPING MEDIUM AND PUMP TYPE			FURTHER INFORMATION	
TRIVIAL NAME	CHEMICAL FORMULA	MODEL	TYPE OF SHAFT SEAL	RELATED APPLICATIONS
Ammonium nitrate	NH_4NO_3	MOR/UMOR/T/MPCT V-AN/MPCTAN	hydrodynamic seal / dry-running magnetic coupling	various pump stations in a fertilizer plant
Adipoladimat	-	MPCH	dry-running magnetic coupling	suitable for emptying residues due to dry-running safety during batch operation
Acrylic acid	$\text{C}_3\text{H}_4\text{O}_2$	MPCH	dry-running magnetic coupling	replacement due to frequent problems on the double mechanical seals
Ammonia	NH_3	MPVAN	liquid-lubricated magnetic coupling	for residue-free tanker unloading despite boiling conditions; installation at ground level possible
Butadiene	C_4H_6	V-AN MPCVAN	double mechanical seal / dry-running magnetic coupling	tanker unloading of liquefied gas without residues; without cavitation and risk of dry-running
Benzene chloride	$\text{C}_6\text{H}_5\text{COCl}$	MPCH	dry-running magnetic coupling	replacement of double mechanical seal pumps due to increasing problems with seals caused by approx. 15 mm carbonaceous cracks
Caprolactam	$\text{C}_6\text{H}_{11}\text{NO}$	MPCH	dry-running magnetic coupling	pumping from container; replacement of heated mechanical seal pumps due to problems caused by crystallization of caprolactam
Demineralized water	deionized water	VKG-AN	hydrodynamic seal + double mechanical seal	boiling conditions, pumping from vacuum
Iron oxide suspension with aniline	Fe_3O_4	M-MOG	double mechanical seal	due to risk of high wear, use of a pump with wear plates for casing protection; material with high chromium content
Fatty acid	$\text{C}_n\text{H}_{2n+1}\text{COOH}$	V-AN	hydrodynamic seal + double mechanical seal	evaporator circuit, pumping from vacuum, low system NPSH value, high media temperature
Hydrofluoric acid	HF	MPCT	dry-running magnetic coupling	dry-running submersible pump with nitrogen blanketing; highly caustic medium
Geothermal condensate	$\text{H}_2\text{O} + \text{H}_2\text{S}$	VKA-AN	hydrodynamic seal + gas-lubricated double mechanical seal	geothermal power plants: use of geothermal energy for power generation
Hexane	C_6H_{14}	MPCVAN	dry-running magnetic coupling	low-boiling application with low system NPSH value
Impregnating pitch	-	MOS	hydrodynamic seal with cylindrical stuffing box	use if impellers have previously been clogged; reduces the problem
Jarosite slurry	$\text{KFe}_3^{3+}[(\text{OH})_6(\text{SO}_4)_2]$	M-MOR/UMOR M-UMOR	hydrodynamic seal with conical stuffing box	pumping from a container; low wear due to wear protection of the casing
Potassium slurry	-	VB	hydrodynamic seal	pumping from a channel
Condensate	H_2O	V-AN	hydrodynamic seal + double mechanical seal	turbine at combined cycle power plant dewatering
Solvents	Aceton, glycol ether, alcohols, aromatic compounds	VKG-AN	hydrodynamic seal + double mechanical seal	low NPSH values, media with poor lubricating properties, media at boiling point

PUMPING MEDIUM AND PUMP TYPE			FURTHER INFORMATION	
TRIVIAL NAME	CHEMICAL FORMULA	MODEL	TYPE OF SHAFT SEAL	RELATED APPLICATIONS
Mother liquor	-	VKG-AN	hydrodynamic seal + double mechanical seal	crystallization
Sodium hydroxide	NaOH	MPVAN / VKG-AN	liquid-lubricated magnetic coupling / double mechanical seal	residue-free tanker unloading (from below) for caustic solutions
Nitrobiphenyl	C ₁₂ H ₉ NO ₂	MPCVAN	dry-running magnetic coupling	applications requiring a hermetically sealed shaft seal
Oleum	H ₂ SO ₄ + SO ₃	MPVAN	liquid-lubricated magnetic coupling	railway tank car unloading from above (specifically heavy liquids)
Phthalic anhydride (PA)	C ₈ H ₄ O ₃	MPCH	dry-running magnetic coupling	one of the basic chemicals; to be pumped hermetically sealed
Phosphoric acid	H ₃ PO ₄	V-AN / VKG-AN / T / MOS / MOR / UMOR / MPCVAN	various types, design depending on concentration and temperature	other inorganic acids
Quenching oil/gasoline/water	-	MPCTAN	dry-running magnetic coupling	slop tank drain pumps
Raw tar	-	MPCVAN	dry-running magnetic coupling	viscous liquids if there are problems with conventional double mechanical seals
Sulfuric acid	H ₂ SO ₄	MOR / UMOR / V-AN / MPVAN / VKS-AN / VKG-AN / VKC	various types, design depending on concentration and temperature	different concentrations / temperatures of sulfuric acid
Nitric acid	HNO ₃	MPVAN / UMOR / UMOG	liquid-lubricated magnetic coupling / hydrodynamic seal	tanker unloading from above
Salt solution with solids	-	UMOS / UMOR / M-UMOS / K-Ti-MOG / MPCH / VKT	various types, design depending on concentration and temperature	melts
Slop with chlorides	H ₂ O + C _x H _x	TCC	hydrodynamic seal + lip seal	slop applications from chemistry or petrochemistry/refinery
Toluene	C ₇ H ₈	MPCTAN	dry-running magnetic coupling	submersible pump from zone 0 tank
Tar	-	MPCVAN / VKA-AN	dry-running magnetic coupling / gas-lubricated double mechanical seal	viscous liquids if there are problems with conventional double mechanical seals, tanker unloading
Titanium tetrachloride	TiCl ₄	MPCVAN	dry-running magnetic coupling	various pump stations in the chloride process
Toluene diisocyanate	TDI	MPCH / MPCV	dry-running magnetic coupling	frequently for applications involving solids
Urea melt	-	VKD-AN	hydrodynamic seal + vacuum-tight liquid barrier	fertilizer sector
Vinyl chloride	C ₂ H ₃ Cl	MPVAN	liquid-lubricated magnetic coupling	unloading liquid gas from tankers
Detergent solution	NaClO, Al ₂ Cl ₃	SK-VUL	hydrodynamic seal + sealed stuffing box	vertical titanium pumps as a welded structure for various caustic solutions
Water, T > 100°C	H ₂ O	diverse VK-AN	various types, design depending on inlet conditions	hot water/condensate applications
Xylene	C ₈ H ₁₀	VKT	gas-lubricated, double mechanical seal	all types of aromatic hydrocarbons
Tin tetrachloride	SnCl ₄	MPVAN	liquid-lubricated magnetic coupling	tanker unloading from above (specific heavy liquids)

DESIGNS				MEDIA PROPERTIES					
PUMP TYPE	MODEL	INSTALLATION TYPE	PROFILE	MEDIUM	CORROSIVE	SOLID-LADEN	TOXIC	BOILING	GAS-LADEN
HORIZONTAL PUMPS	MOR / UMOR	horizontal hydrodynamic	for organic liquids containing solids; hydrodynamic, completely frictionless shaft seal with axial shaft displacement for maximum safety	Ammonium nitrate	yes	yes, for high solids concentrations	no	no	yes
	MOS / U MOS	horizontal hydrodynamic	for organic liquids containing solids, hydrodynamic, dry-running graphite stuffing box	Phosphoric acid, nitric acid, sulfuric acid	yes	yes, for high solids concentrations	no	no	yes
	MOG / UMOG	horizontal hydrodynamic	for organic liquids containing solids; hydrodynamically balanced and protected double mechanical seal	Titanium tetrachloride	yes	yes, for high solids concentrations	yes	no	yes
VERTICAL-PUMPS	VK-AN	vertical self-regulating dry	NPSH-optimized vertical pump with pressure equalization port and self-regulating properties; hydrodynamically balanced shaft seal	Condensate	yes	yes	yes, in version with double mechanical seal	yes	yes
VERTICAL PUMPS + PUMPS WITH MAGNETIC COUPLING	MPVAN	vertical dry with magnetic coupling	Vertical pump with zero flow rate safe magnetic coupling for the most challenging applications	Oleum, nitric acid, chemical liquids	yes	no	yes	yes	yes
	MPCVAN	vertical dry with magnetic coupling	NPSH-optimized vertical pump with dry-running magnetic coupling for the most challenging applications and with additional self-regulating function	Titanium tetrachloride in the chloride process	yes	yes	yes	yes	yes
PUMPS WITH MAGNETIC COUPLING	MPCH DryRun	horizontal dry with magnetic coupling	Horizontal pump with dry-running magnetic coupling for the most challenging applications	Phthalic anhydride (PA) acrylic acid, caprolactam	yes	yes	yes	yes	yes
PUMPS WITH MAGNETIC COUPLING + SUBMERSIBLE PUMPS	MPT (AN)	Submersible pump vertical motor outside	Submersible pump with product-lubricated slide bearing and hermetic sealing by means of magnetic coupling	Oleum, nitric acid, chemical liquids	yes	no	yes	yes	yes
	MPCT (AN)	Submersible pump vertical motor outside	Submersible pump with dry-running magnetic coupling, all roller bearings without product contact, NPSH value close to zero; for very difficult pumping media	Contaminated hydrocarbons, refinery wastewater (slop) including from zone 0	yes	yes	yes	yes	yes
SUBMERSIBLE PUMPS	T (-AN)	Submersible pump vertical motor outside	Submersible pump with hydrodynamic sealing without bearing and without shaft seal in the liquid	Ammonium nitrate, phosphoric acid, waste water	yes	yes	limited suitability	yes	yes
	TCC (-AN)	Submersible pump vertical motor outside	Submersible pump for greater immersion depths with gas-sealed shaft seal; roller bearing without contact with the pumped medium	Condensate, waste water	yes	yes	limited suitability	yes	yes
	VKT	Short submersible pump vertical Main impeller outside	Container pump with very small installation space, can be combined with injector	Chemical liquids, molten salt	yes	limited suitability	yes	no	no
CONTAINER PUMPS	VB	vertical dry or submerged, inlet from above	Vertical container pump with inlet from above for very small suction heads and/or media containing solids	Potassium hydroxide solution, muddy, gaseous wastewater; feed from above	yes	yes	no	no	yes

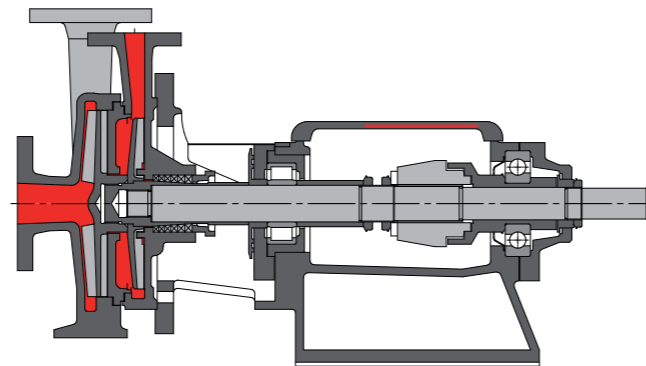


FIG. 1: UMOR
with hydrodynamic seal

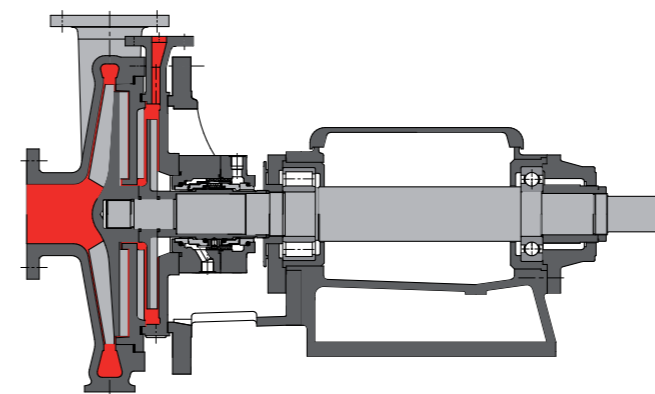


FIG. 2: UMOG
with fully balanced double mechanical seal

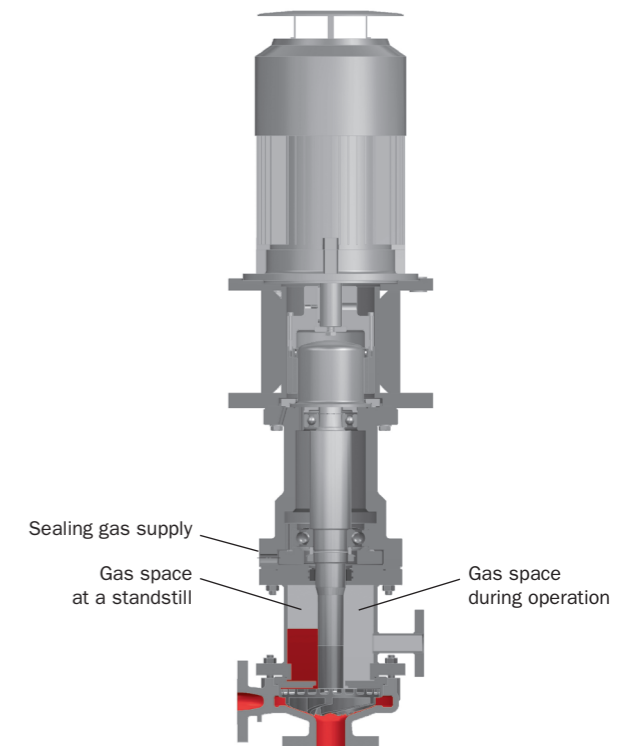


FIG. 3: MPCVAN
with dry-running magnetic coupling

BUILDING BRIDGES. FROM HYDRODYNAMICS TO MAGNETIC COUPLING.

A centrifugal pump usually consists of three components:

- Pump hydraulics (impeller and casing)
- Shaft seal
- Pump bearing

The pump hydraulics ensure efficiency and pumping performance. Needless to say, the tasks involved here are many and varied. With a simple water pump, for example, it is “only” a matter of achieving optimum efficiency. In more demanding operations, on the other hand, the focus is usually on problem solving. The German Technical Instructions on Air Quality Control (TA-Luft), pumps for hazardous areas or the pumping of media containing solids represent tricky cases.

Bungartz always overcomes such challenges with the most operationally reliable solution. The range is wide. It covers everything from the simple hydrodynamic shaft seal, which requires no maintenance or sealing fluid, to the dry-running magnetic coupling, which is on a par in terms of operational reliability.

But enough with boring theory. A real-life example can illustrate the evolution of the shaft seal over a period of more than 30 years.

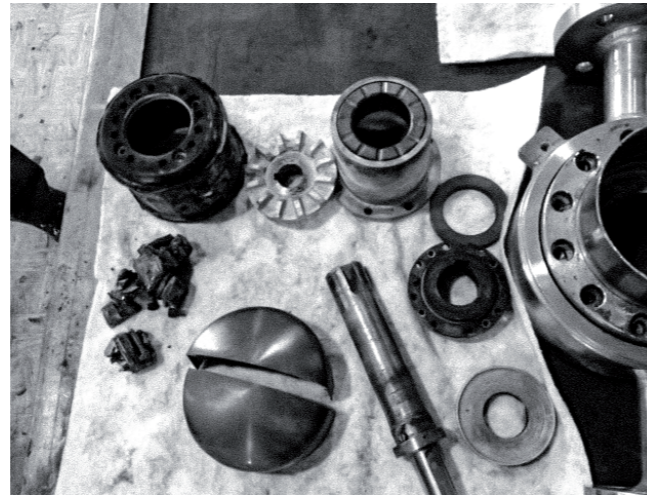
Titanium tetrachloride $TiCl_4$ is a hazardous medium. It exists as a clear liquid or slurry with coke solids. It forms a hydrochloric acid mist (HCL) in combination with water or even with atmospheric humidity. Larger leaks can therefore become dangerous. Another problem: Chlorine ions can permeate through sealing gaps into the sealing medium in double mechanical seals commonly used today.

Bungartz addressed the issue – initially with a UMOR type pump. The horizontal pump with a hydrodynamic seal as its primary seal and dry-running stuffing box as secondary seal (Fig. 1) did the job reliably during decades of continuous operation.

But what happens in the event of the smallest leaks or dangerous emergency scenarios such as power failures? To counter this, the pump was equipped with a double mechanical seal. This was the beginning of the UMOG/MOG type (Fig. 2). The only downside: The double mechanical seal did not manage the more than five-year service life of the original hydrodynamically sealed stuffing box pump.

Minimizing leakage while maximizing service life: a tough nut to crack. The MPCV type (Fig. 3) was a lifesaver. The dry-running magnetic drive pump already passed its first test in 2007 when facing $TiCl_4$ slurry.

To date, the MPCVAN with dry-running magnetic coupling has been the standard for many plants involved in the chloride process. Today, more than 150 Bungartz pumps boast a service life of five to seven years without requiring any maintenance. A new benchmark! And there is even more: This type of pump now achieves a flow rate of $650 \text{ m}^3/\text{h}$ (motor 160 KW).



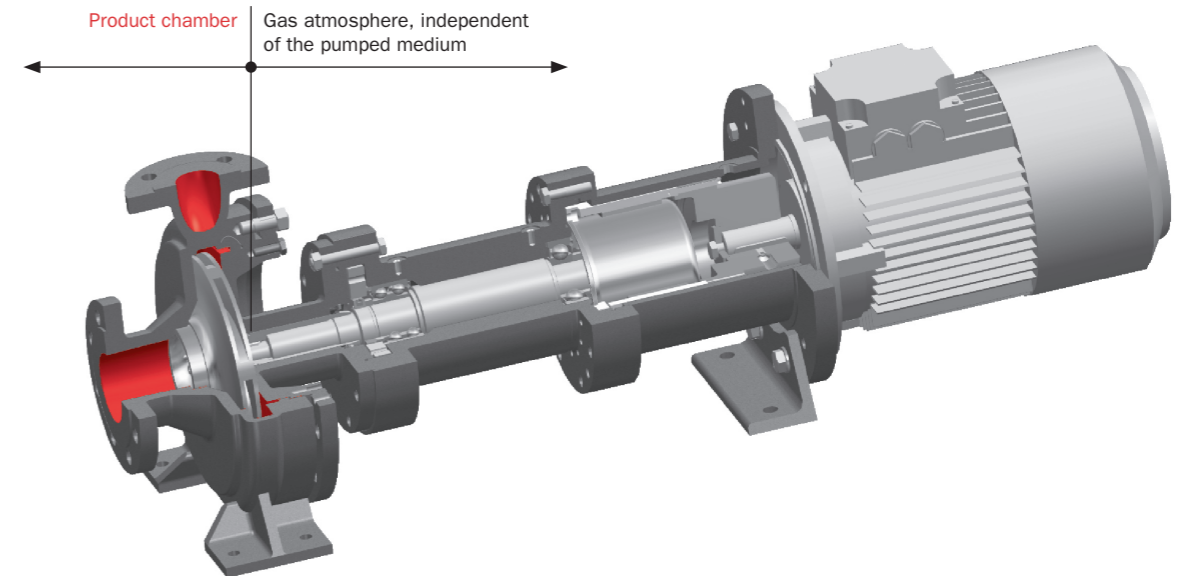
TYPICAL DAMAGE PATTERN
for a standard magnetic coupling pump

EXCHANGE FOR GOOD CAUSE. MAGNETIC COUPLING INSTEAD OF MECHANICAL SEAL.

THE PROBLEM.

The circulating pump in an emulsion evaporation plant is tasked with processing used cooling lubricants, washing liquids and other oil-water emulsions. The medium to be pumped is a contaminated, slightly viscous oil concentrate which forms hard incrustations upon cooling.

The existing pump with double mechanical seal has its weaknesses. Even after several improvements, it cannot cope with the application and often fails. Several inconvenient failures per year make the pump unprofitable. At times, severe leakage and vacuum loss occurred in the evaporation plant every six weeks.



UNCOMPLICATED REFURBISHMENT
on the MPCH DryRun

THE SOLUTION.

Bungartz presented the customer with a MPCH DryRun model which operates as a dry-running magnetic coupling pump. Compared to liquid-lubricated standard pumps with double mechanical seals or MAC, it offers great advantages when used for media containing solids.

The replacement was carried out without any problems, as the connection dimensions of the old pump being replaced could be maintained. The existing thermosiphon system of the mechanical seal was replaced by a maintenance-free gas barrier system.

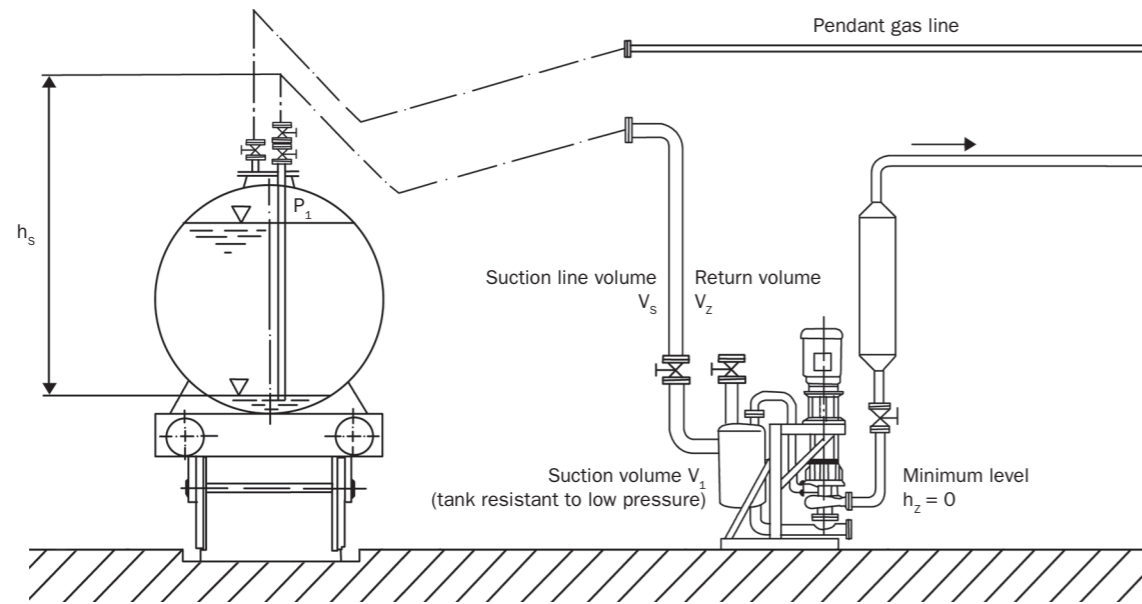
After one year, the powerful pump was checked. Conclusion: no wear whatsoever. Without any maintenance measures, the MPCH DryRun was able to dutifully resume its service.

AREAS OF APPLICATION.

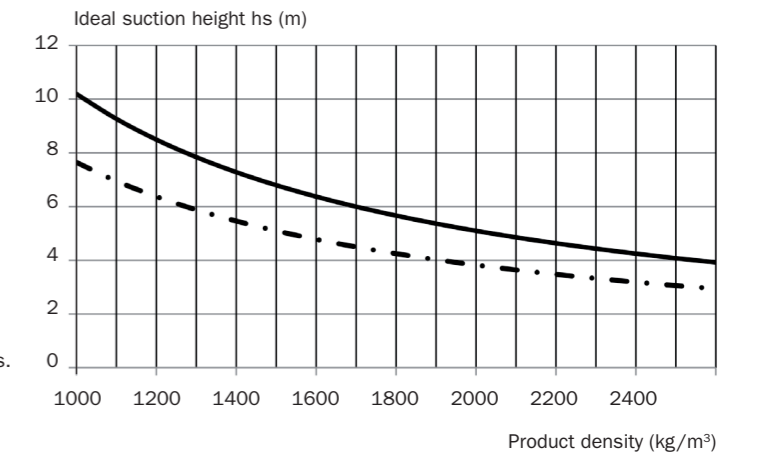
Standard pumps with product-lubricated magnetic couplings or with mechanical seals in contact with the product have their pitfalls with some media – such as when the media is crystallizing, polymerizing, contains solids, or is viscous. The MPCH DryRun (horizontal) or MPCV (vertical) dry-running magnetic coupling pumps are ideal for these difficult applications.

THE BENEFITS.

- maintenance-free = low operating costs
- easy monitoring
- operationally reliable
- hermetically sealed
- safe to run dry



TANKER UNLOADING
from above



EVALUATION OF THE IDEAL CONSTRUCTION HEIGHT

CHANGE OF DIRECTION. TOTAL DRAINAGE FROM TOP.

THE PROBLEM.

Zinc tetrachloride presents many challenges. Firstly, it is highly dangerous, as vapors of gas are generated when the product escapes. Like titanium tetrachloride, it reacts with moisture in the air. Secondly, it has a high specific gravity of 2.23 kg/dm³. This makes it difficult to extract the toxic medium from the top of the railway tank car. At the highest point of a four-meter suction lance, typical for railway tank cars, a negative pressure of approx. 0.12 bar abs. is formed. This renders unloading with conventional centrifugal pumps impossible.

Forcing it out with overpressure is also not a good idea. One reason is the risk of operating errors. Another is the fact that the pressurized gas has to be decompressed from the railway tank car at the end and disposed of.

THE SOLUTION.

The hazardous medium should therefore no longer be unloaded from the bottom of the railway tank car, but from above via the dome cover. The MPVAN vertical pump with liquid-lubricated magnetic coupling copes perfectly with the high specific gravity of zinc tetrachloride.

The pump is connected to the suction tank via a pendant gas line. It runs with extremely low suction pressure drop (NPSH) of < 0.01 bar. The MPVAN may also con-

tinue running at zero discharge, which means that complete emptying is feasible. It can achieve suction over four meters.

AREAS OF APPLICATION.

Discharge from above is required, and there is a low suction pressure due to the high specific gravity of the pumped medium. In that case, a self-regulating pump with an NPSHr close to 0 is the first choice. It is also suitable for draining sulfuric acid, oleum, nitric acid or mixed acids from above. If the medium also contains solids, the MPCVAN model with dry-running magnetic coupling can be used.

THE BENEFITS.

- no dangerous pressurization of the railway tank car necessary
- no disposal of sealing gases necessary
- high safety due to emptying from top
- reliable installation without the need for monitoring
- hermetically sealed

PUMPING MEDIUM	DENSITY (kg/m ³)	VAPOUR PRESSURE (20 °C) bar	SUCTION HEAD h _s (liquid column)
Mixed acid (88% NHO ₃ , 11% H ₂ SO ₄)	1590	0,064	6,0
Sulphuric acid 96%	1830	< 0,02	5,46
Oleum 28% SO ₃	1935	< 0,02	5,16
Tin tetrachloride	2230	< 0,0125	4,46

Analysis of several heavy liquids

RUNNING DRY. UNLOADING OF SEVERAL TANKERS.

THE PROBLEM.

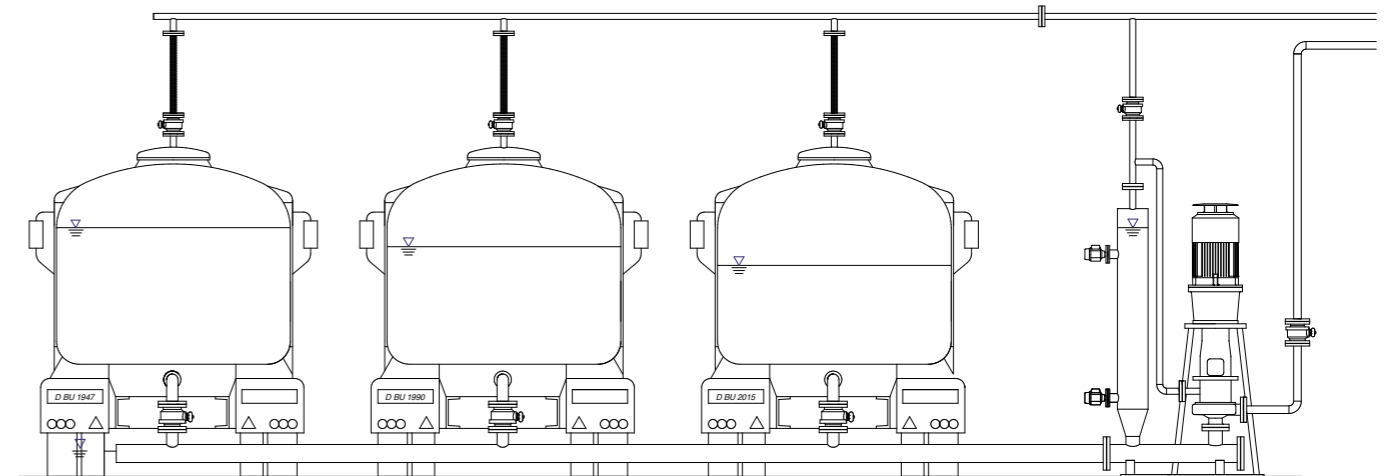
Completely discharging liquid tar is a delicate matter. The issues involved here: higher viscosity, sticking and damage to common double mechanical seals, and large residual volumes in the tanker.

The highly viscous “carbon black” raw material, also known as coal tar, is such a difficult medium to extract. It should be emptied simultaneously and completely from several wagons – from below.

THE SOLUTION.

With just one pump, Bungartz manages to empty four wagons one after the other. Without residue!

The MPCVAN pump, installed on a vacuum-proof primary feed pipe, manages this with ease. It builds up a high suction pressure, enables fast emptying and even residual emptying thanks to the pump that is safe to run dry. Since the MPCVAN is self-regulating, it can empty even the smallest residual quantities down to zero delivery. It doesn't get any emptier than that!



MPCVAN type
sticky and viscous from the bottom
of railway tank cars (liquid tar)

Bungartz relies on a similar unloading station for liquid tar when emptying tankers of another customer. Initially, only one pump station is converted from a conventional suction pump to a self-regulating pump. The results are impressive: With this solution even the hose becomes empty. This makes a collection bucket unnecessary when uncoupling.

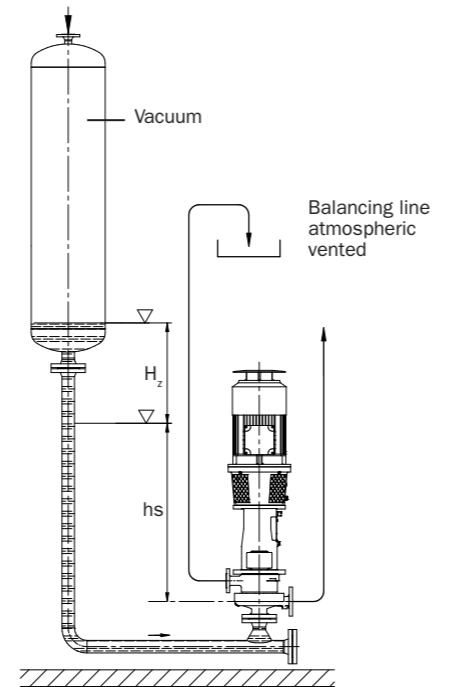
In this particular case, the pump has been in operation for over seven years – with up to five daily discharges. The bearing was never replaced during the whole period.

AREAS OF APPLICATION.

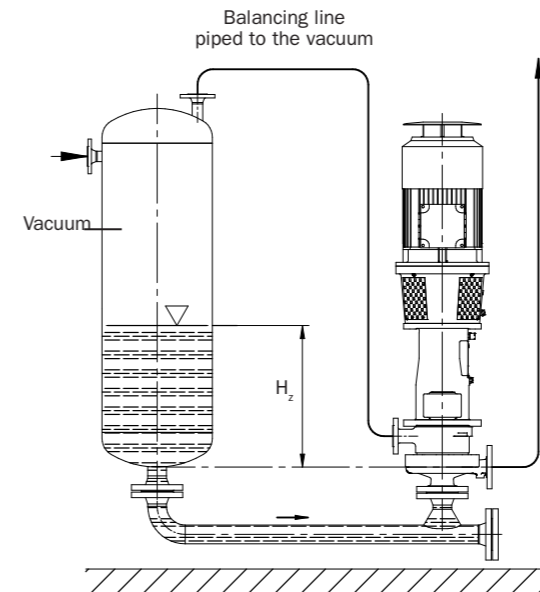
Viscous, containing solids or toxic: All these liquids can be discharged with confidence using the robust MPCVAN pump. With the dry-running magnetic coupling, only the impeller and casing come into contact with the product. Bearing and magnetic coupling are self-sufficient, they work regardless of the pumped medium.

THE BENEFITS.

- complete emptying even when dealing with several tankers
- no contamination and damage of the shaft seal
- maximum safety due to hermetic shaft seal by means of dry-running magnetic coupling
- high running times of more than five years without maintenance
- up to ATEX zone 1



UREA MELT
conventional



UREA MELT
optimized

TIME LAPSE. FASTER DELIVERY OF MOLTEN UREA.

THE PROBLEM.

Molten urea packs a punch. When it is conveyed from the vacuum, the quality of the end product must not suffer under any circumstances. However, as soon as the product comes out of the evaporation process, it tends to crystallize. Therefore, the process must be lightning fast. The longer the path from liquid urea to granulation, the more biuret is formed – which is an undesirable by-product.

However, standard centrifugal pumps need regulation and often require feed tanks. This increases the retention time of the product and damages the quality of the urea granules. Operators try to optimize the process by minimizing stand height and liquid volumes. With standard pumps, however, this leads to problems, such as gas input.

THE SOLUTION.

A pump with hydrodynamic and therefore robust sealing technology is required. The VKD-AN vertical pump fits the bill perfectly. Equipped with hydrodynamic sealing and vacuum-tight liquid barrier, it requires little suction head and has an NPSHr close to 0. This reduces the amount of time the product spends in the system.

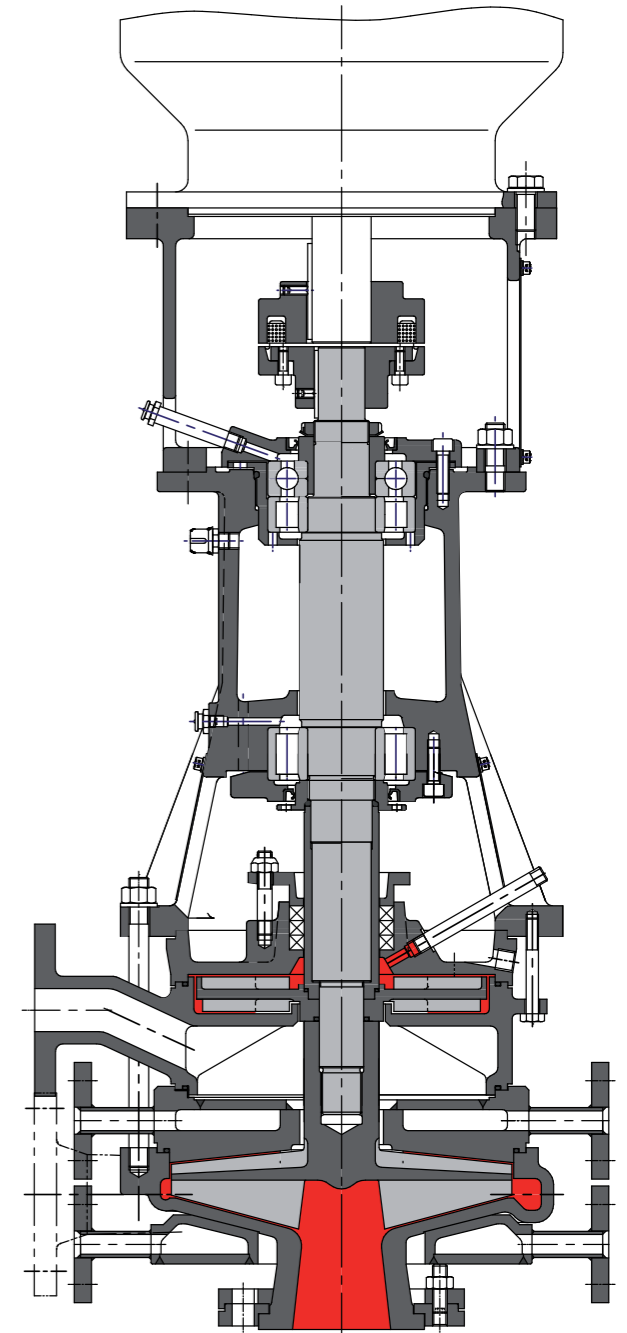
Instead of large-volume feed tanks, a low-volume inlet pipe is sufficient and saves space. Any gas/vapor that has been entrained is returned via the gas equilibrium line of the pump.

AREAS OF APPLICATION.

The V-AN type pump makes a lot of things easier. It can extract directly from the vacuum. The powerful vertical pump can be used to reduce the overall height of the plant considerably – by several meters – wherever evaporators or evaporation plants are used to pump from the vacuum.

THE BENEFITS.

- no need for feed tanks
- > thus low volume and retention times
- > very low biurite content in the end product
- operationally safe and reliable thanks to hydrodynamic shaft seal
- pumping from the vacuum at low feed heights
- emptying of residues also from the vacuum



VKD-AN
Vertical pump with hydrodynamic seal
and vacuum-tight liquid barrier



CERAMIC IMPELLER
Front before finishing

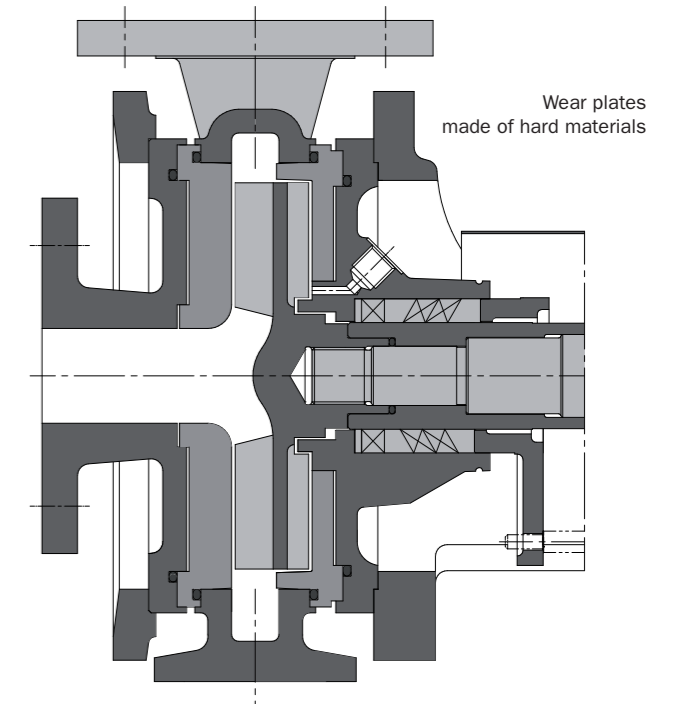
EXTENSION. CONSIDERABLE INCREASE IN SERVICE LIFE.

THE PROBLEM.

Another exciting case is a fertilizer mixture that can have sand content from 5 to 15 % due to fluctuating quality of the base product. The sticking point: Wear on the pump material and failure of the pump. This is often due to up to 40% high solids content in the pumped medium, also known as solids suspension. Temperature and corrosion do the rest. Depending on the solids properties – size, shape, round, sharp-edged, hard – ordinary existing pumps only manage service lifetimes of four to six weeks. Too little!

THE SOLUTION.

The M-MOR/M-UMOR/M-MOS/M-UMOS horizontal pump has proven to be a tailor-made solution. The standard semi-open impellers with back vanes suffer significantly less wear: thanks to the better flow guidance. The back vanes keep the shaft seal area free of solids and wear during operation. In the fertilizer sector, dry-running stuffing boxes or double mechanical seals are suitable as downstream secondary seals.



M-MOS

The running time is significantly extended if the pump is equipped with robust wear plates made of silicon carbide, which are optimally adapted to the hydraulics system and for use in the pump. The last, efficient measure is the use of a ceramic impeller, which normally remains intact even after years of use.

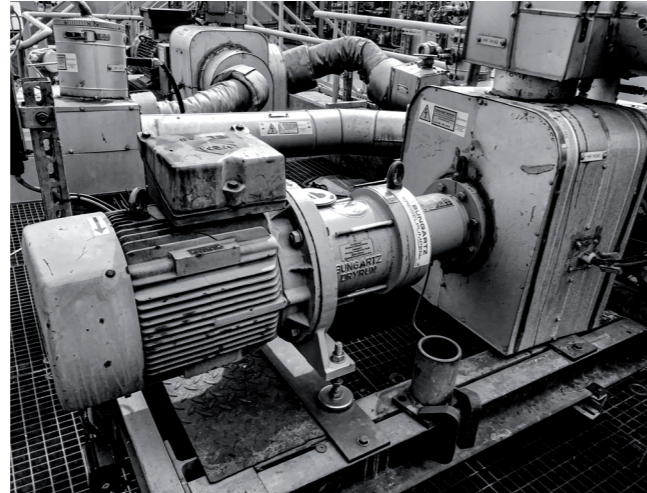
These measures immediately increased the service life of the pump, by a factor of 6, to half a year. Further optimizations have even brought the current figure to 12 months. That is not yet all. The next improvements are already being planned.

AREAS OF APPLICATION.

Fertilizer industry, pigment industry, metal extraction: Bungartz supplies efficient solutions for the sealing components in these industrial sectors – from hydrodynamic sealing to dry-running magnetic coupling. This optimizes the pumps considerably in terms of wear.

THE BENEFITS.

- extension of the service life up to 12 times (12 to 24 months after replacement)
- safe to run dry
- high wear protection thanks to wear plates
- various material combinations
- > thus high wear and corrosion protection
- hydrodynamically balanced shaft seal
- > protection from solids



MPCH DryRun
Pump casing thermally insulated

ABOVE WATER. REPLACEMENT OF A SUBMERSIBLE PUMP FOR MELTS.

THE PROBLEM.

Where a submersible pump is installed in a tank and is difficult to access, maintenance is by no means an easy task. High safety requirements are necessary. Therefore, it needs to be replaced by a dry-installed horizontal pump.

For the toxic liquid melt PA (phthalic anhydride), the German Technical Instructions on Air Quality Control (TA-Luft) require a hermetically sealed pump with double mechanical seal or a pump with magnetic coupling. The seal and magnetic coupling are put through their paces here. The pump is required to be heated and thermally insulated, and the sealing system should be low-maintenance.

THE SOLUTION.

As the medium PA (phthalic anhydride) is subject to the German Technical Instructions on Air Quality Control (TA-Luft), a horizontal pump with dry-running magnetic coupling is used: MPCH DryRun type. The pump must be heated, as the medium becomes solid below 131 °C.

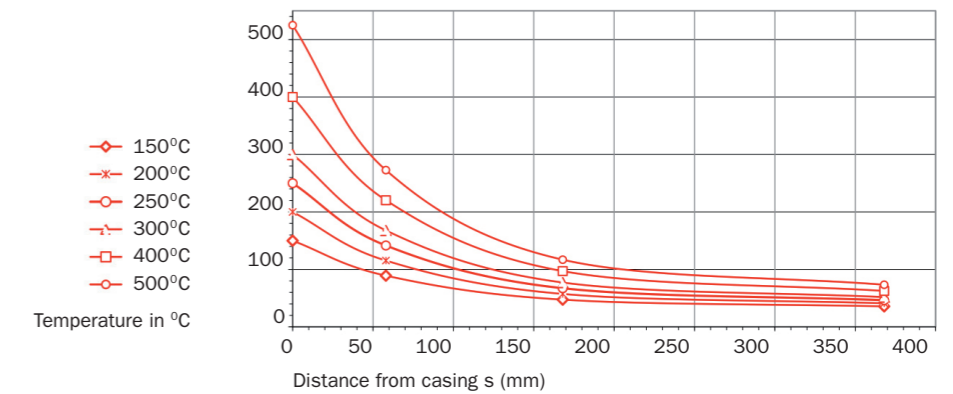
Here, the bearing and sealing unit operates completely independently of the pumped medium and is blanket-ed with nitrogen. The pump hydraulics consist of impeller and pump casing. They alone come into contact with the pumped medium.

The separation of product chamber and sealing/bearing space is unique. The condition of the pump can therefore be effectively monitored. Although the pump hydraulics are completely thermally insulated (see picture above), the bearing maintains a temperature below 50 °C at a product temperature of 230 °C. This is a tremendous performance!

AREAS OF APPLICATION.

All melts such as caprolactam, salt melts, ammonium nitrate melts and urea melts are run in high temperature ranges and require heated pumps. Bungartz has developed sealing technologies adapted to these media.

When dealing with organic media not covered by the German Technical Instructions on Air Quality Control (TA-Luft), the classic hydrodynamic seal comes to the rescue. For toxic media, the dry-running magnetically coupled pump MPCH DryRun, the vertical MPCV(AN) or the submersible pump MPCTAN are recommended.



MPCH DryRun
Temperature profile of casing and bearing mount
(ambient temperature 15 - 20 °C)

THE BENEFITS.

- high temperature gradient from impeller to bearing
- suitability for high temperatures such as for melts
- safe to run dry
- resistant to malfunctions
- bearing and magnetic coupling are not in contact with the product
- no dry-running protection required
- very low maintenance costs
- optimized monitoring of the condition
- MTBF over five years without maintenance



MPCTAN

Pump functions until the end,
performance only reduced due to contamination

DRY RUN. SLOP DRAINING IN ATEX 0 ZONE.

THE PROBLEM.

Hydrocarbons form a permanently explosive mixture with air (zone 0). Therefore, utmost caution is required when emptying the pit. The hazardous substances may be present at the boiling point, in addition to being heavily contaminated.

THE SOLUTION.

The submersible pump MPCTAN is a compelling patented solution. It impresses with its very small NPSHr value (< 0.1 m) and the semi-open impeller. The bearing and sealing unit are surrounded by nitrogen, allowing the pump to be used in Zone 0 atmospheres. Monitoring of the sealing gas system makes any other monitoring (level sensors) in the pit unnecessary.

The pump ran fault-free for years. Then it was at a standstill for a long period of time. After restarting, the pump showed lower performance. But it did pump.

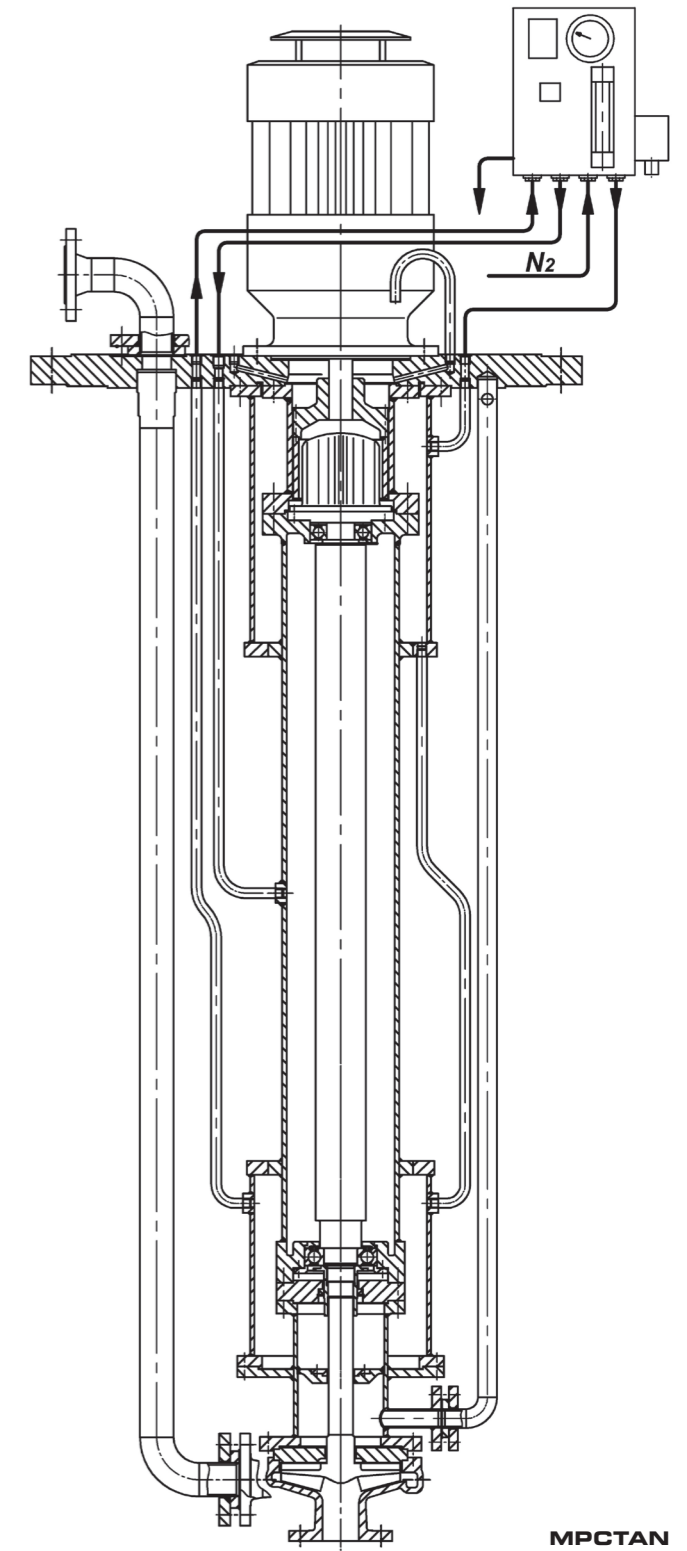
An inspection revealed a completely clogged suction strainer (see picture). This was cleaned, the pump went back into action without an overhaul. And lo and behold, it returned to full power.

AREAS OF APPLICATION.

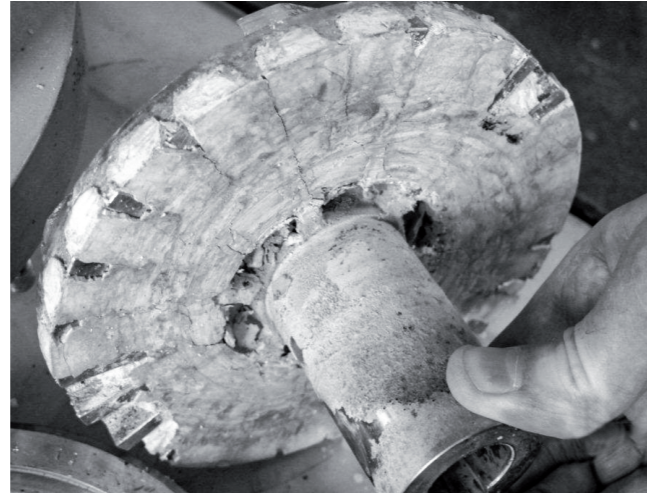
The MPCTAN does a great job when needed. Its dry-running magnetic coupling has generally proven its worth in dry-running and media with solids.

THE BENEFITS.

- high system availability
- no bearing and seal in the pumped liquid
- > therefore independent of the pumped medium
- safe to run dry
- little monitoring, even for zone 0 usage
- NPSH close to zero
- > can therefore be used with boiling media
- durable and robust,
even in the event of a lack of fluids



MPCTAN



MPCV
no damage despite clogged impeller

ENDURANCE RUN. RESISTANCE TO SUDDEN POLYMERIZATION.

THE PROBLEM.

The task: Different media need to be pumped in a technical center. A commercially available magnetically coupled pump was used to achieve this.

Since some media tend to polymerize abruptly, the impeller unfortunately jammed. This in turn led to the magnetic coupling breaking off and clogging. Then the pump totally failed. What was needed, therefore, was higher system availability.

THE SOLUTION.

The vertical pump model MPCV has roller bearings separate from the medium and a dry-running magnetic coupling. This is overlaid with nitrogen. This means that the bearings and seal operate completely independently of the pumped medium.

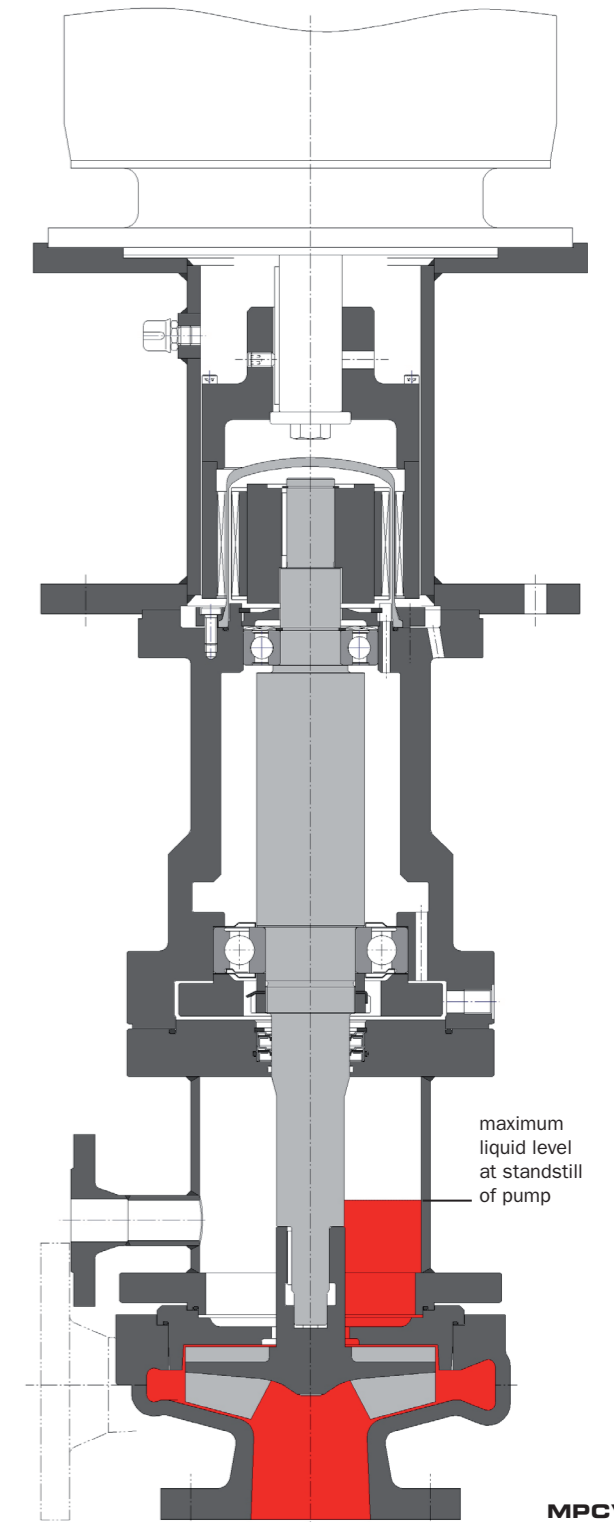
The impeller very seldom clogs (see picture). Previously, the standard magnetic drive pump was completely destroyed as a result of such conditions. The impeller of the MPCV, however, was cleaned and the pump worked again. The dry-running magnetic coupling of the MPCV with the gas inlet and the resulting gas cushion located in front of the lip seal ensures that the pump remains intact. Even with abrupt polymerization.

AREAS OF APPLICATION.

The dry-running magnetic coupling is in its element with media containing solids. Whenever the medium requires a magnetic coupling due to its toxicity, but solids, gas content or high viscosities preclude a standard magnetic pump, the variant that is safe to run dry can help. As it is conveniently equipped with a magnetic and bearing unit that operates independently of the medium.

THE BENEFITS.

- safe to run dry
- adapted for emptying residues
- high availability of pump and system
- hardly any monitoring required
- low maintenance costs
(only impeller and casing are in contact with the pumped medium)
- magnetic coupling and bearing unit separate from the medium



GIVE IT SOME GAS. PUMPING OF FOAMS.

THE PROBLEM.

Another example: A chemical is added to a flotation tank to separate KCl and NaCl. This results in an undesirable, high gas concentration in the pumped medium. One component foams up in the process and is discharged via a separate channel. Clear case: The foam needs to be pumped. And the system needs to be available for a longer period of time.

THE SOLUTION.

A VB type pump provides an effective remedy here. The foamed product reaches the impeller from above. A special jacket tube makes it possible to degas the front impeller area. This allows foams, i.e. media with 80% gas content, to be pumped effortlessly. The shaft seal operates without any contact with the product and under atmospheric conditions. As a rule, a dry-running graphite stuffing box is to be used here. A clean solution!

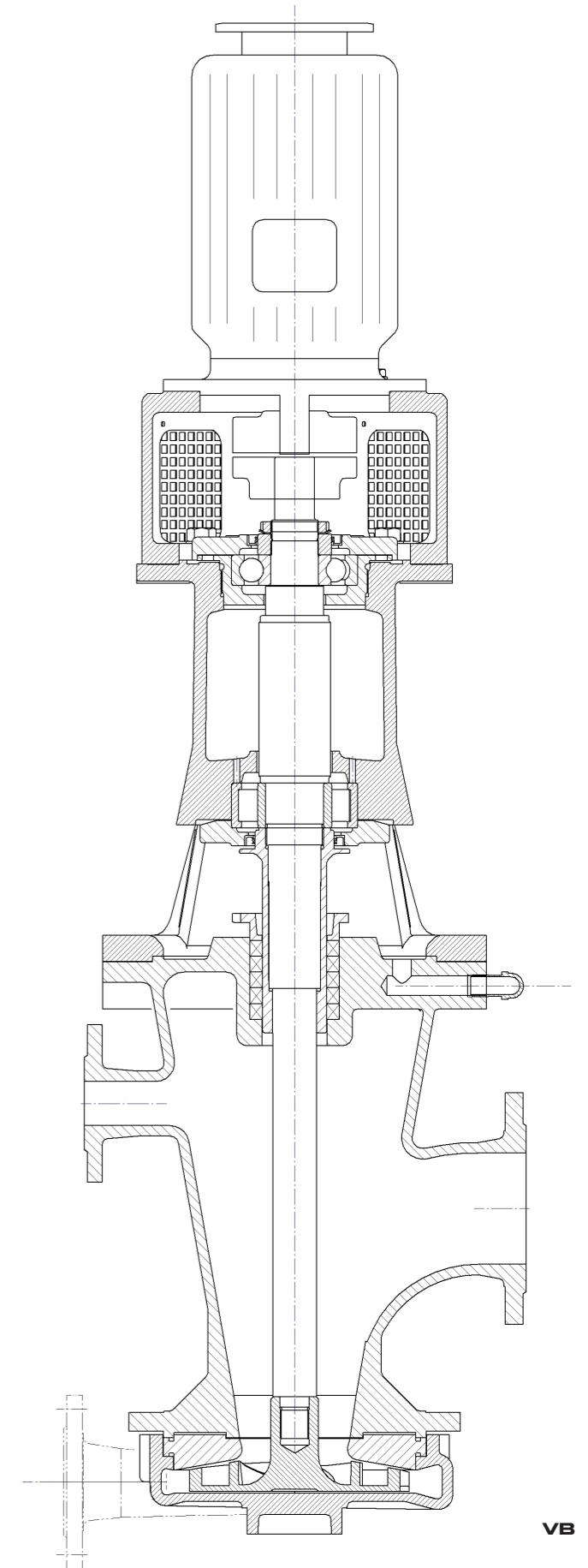
AREAS OF APPLICATION.

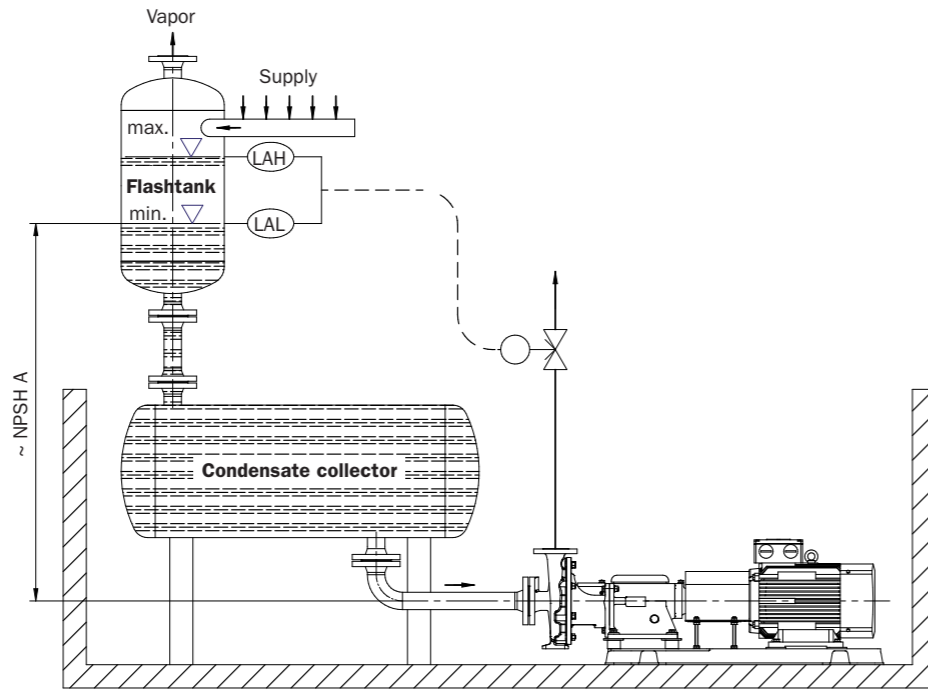
In general, media with high gas contents can be pumped. Whenever it is necessary to discharge media from systems without regulation, and when there is also little inlet head, the VB proves to be a solution that is as simple as it is clever. It does not require any pump receiver.

The impeller is completely open (star wheel) and is fed from above. Therefore, this pump is ideal for muddy and also viscous media.

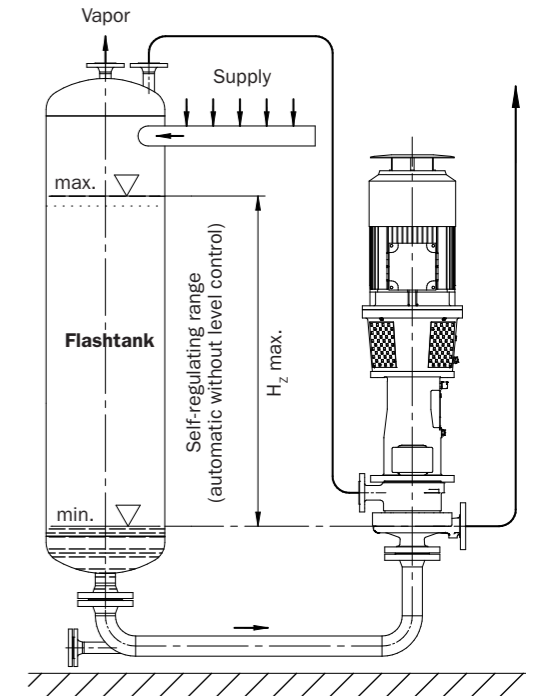
THE BENEFITS.

- direct installation on overflow channel possible
- no feed tank necessary
- only very low suction heads required
- low maintenance costs due to simple shaft seal
- suitable for gaseous, muddy and viscous media





STANDARD SUCTION PUMP
complex condensate collection system required



V-AN
direct pumping from Flashtank

STRONG PERFORMANCE. PUMPING OF CONDENSATES.

THE PROBLEM.

Water condensates and steam are present under different pressures: from vacuum to overpressure. For example, in combined cycle power plants, these are fed into so-called flash tanks. They must then be transferred to the liquid stage so that a centrifugal pump can start to operate.

Turbine dewatering is carried out in the power plant with drain pumps. Both approaches normally require elaborate condensate collection systems/reservoirs with high inflow, control technology and dry-running protection.

If possible, it should not be built into the ground, but at ground level. Pumps with the smallest NPSHr values are therefore needed, especially for compact combined cycle power plants. They must also be unaffected by a lack of liquid or steam content in the condensate and be content with little suction head.

THE SOLUTION.

With the powerful VKS-AN/VKG-AN, you're right on track. The vertical pump impresses with a very low NPSHr value due to the pressure equalization to the impeller inlet. It is also relatively insensitive to dry-running.

If gas vapor ever enters the pump, immediate action is taken. This is because it quickly returns to the tank on the inlet side via the compensation line. The VKS-AN/VKG-AN pumps directly from the flash tank, which may also be under vacuum. And this at gentle suction heads (H_z) of normally less than two meters.

AREAS OF APPLICATION.

The possibilities are numerous. Whenever a medium is close to its boiling point or is being pumped from a vacuum, headroom can be saved by using the V-AN vertical pump. And it can extract directly out of the vacuum. Often a simple inlet pipe is sufficient, from which the pump then pumps in a self-regulating manner.

THE BENEFITS.

- no condensate tank required
- installation directly on the inlet pipe or flash tank
- low overall height for suction heads H_z below 2 m
- NPSH pump close to zero, i.e. emptying of residues up to $H_z = 0$ m
- safe to run dry, low monitoring requirements
- low susceptibility to malfunctions, low maintenance due to simple hydrodynamic shaft seal

PRODUCT RANGE.**Centrifugal pumps, horizontal**

with hydrodynamic shaft seal
up to the dry-running magnetic coupling

Centrifugal pumps, vertical

- for dry installations, short design
- for wet installations,
without bearings in the liquid
- for wet installations,
with roller bearings independent of product
- with feeder propeller
for space-saving installation

Centrifugal tank pumps

with inlet from above

Centrifugal pumps, impeller variants

- with semi-open impellers
- with closed impellers
- with torque flow impellers

Hermetic rotary piston pump

- hermetically sealed
- without bearing in the liquid
- low-pulsation
- also suitable for higher viscosities

Downstream seals

for pumps with hydrodynamic relief of the shaft gap

- gland packing
- mechanical seal
- magnetic coupling
- special solution for problem cases
- lip seal

Comprehensive information about each type of pumps is featured in individual product brochures.

MATERIALS.

- all castable and weldable stainless steel qualities
- castable and weldable special alloys
- grey cast iron, rubber lined
- special materials such as titanium, zirconium, SiC etc.
- Plastic (HRK only)

**REAL SPECIALISTS.
THE CENTRIFUGAL
PUMPS AT A GLANCE.**