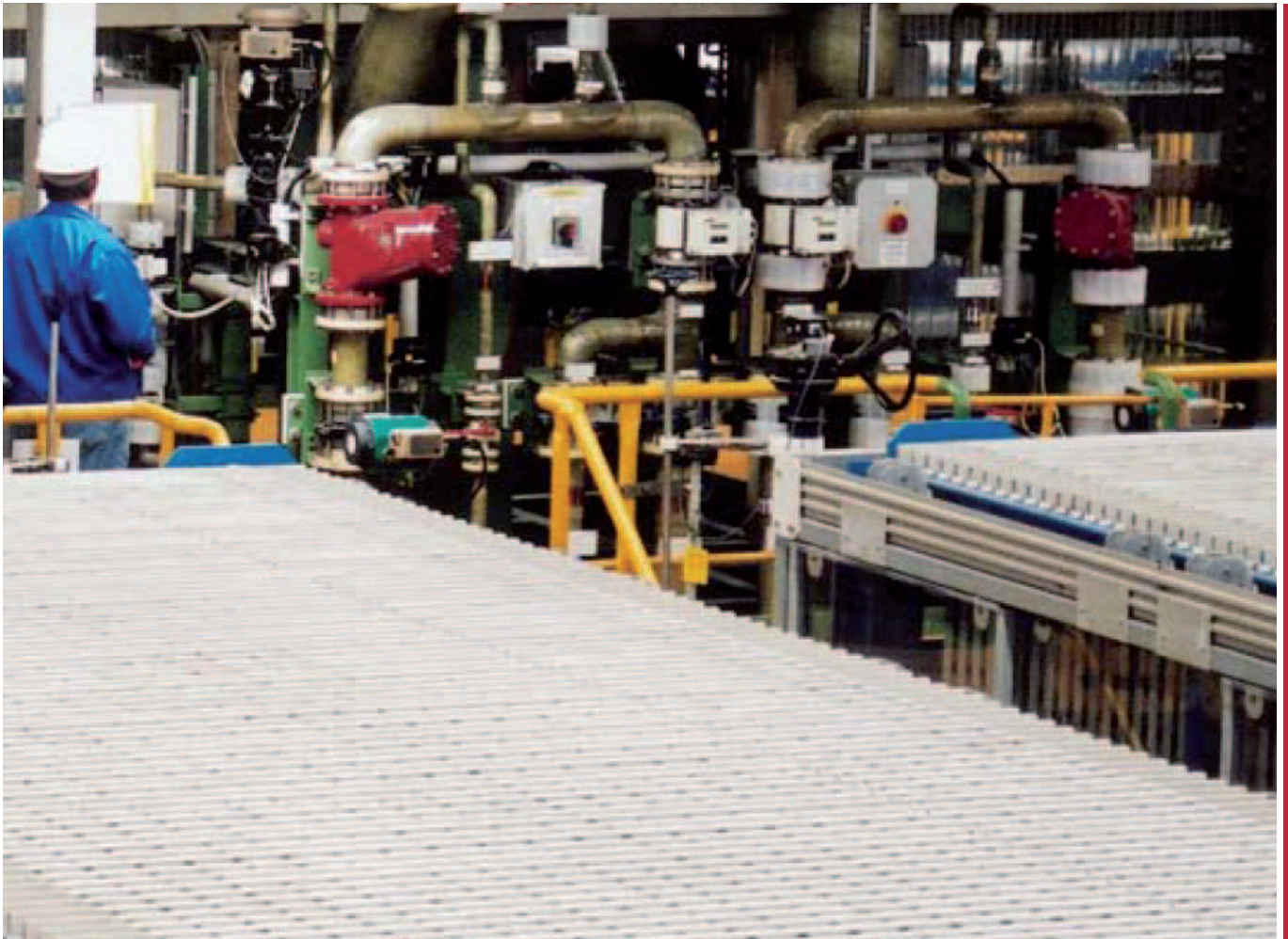


Chlor-alkali Electrolysis

Richter Process Pumps, Valves and Control Equipment



- Highly corrosion resistant
- Raw to ultra-pure NaCl, NaOH, NaOCl, H₂SO₄, HCl, wet and dry Cl₂ gas
- -75 to +400 °F (-60 to +200 °C)
- Cost, reliability and environmental advantages over metal and sealed equipment



Specialist for corrosive fluids

For more than 5 decades Richter has been the specialist for corrosive and highly corrosive fluids in chemical, pharmaceutical, environmental and industrial applications. Numerous innovations have been driving the standard keeping Richter at the pole position when corrosion matters.



PFA/PTFE lined pumps and valves in a skid-mounted electrolysis system

Within the chemical industry, chlor-alkali electrolysis has become Richter's most extensive field of application with installations around the globe, from brine handling through chlorine drying to caustics.

Expertise is what counts:

- Richter's focus on PFA/PTFE and PE-UHMW lined process pumps, valves and control equipment ideally meets the operator's need for real corrosion and temperature resistance.
- Besides mechanically sealed pumps Richter is even more known for its pioneering range of magnetic drive process pumps – unique with SAFEGSLIDE® PLUS dry run optimization, unique with flows to 600 m³/h (2.650 USgpm).
- The globally most comprehensive and most reliable range of fluoropolymer PFA/PTFE lined on-off, flow control, safety relief, check, filtering and other valves ideally complements the pump offering.

Richter equipment is successfully applied for handling of

NaCl raw, purified and ultra-pure brine

Anolyte, NaCl chlorinated and depleted brine

H₂SO₄ sulphuric acid to 98 %, with and without Cl₂

Catholyte, NaOH caustic soda 32 to 60 %

HCl hydrochloric acid

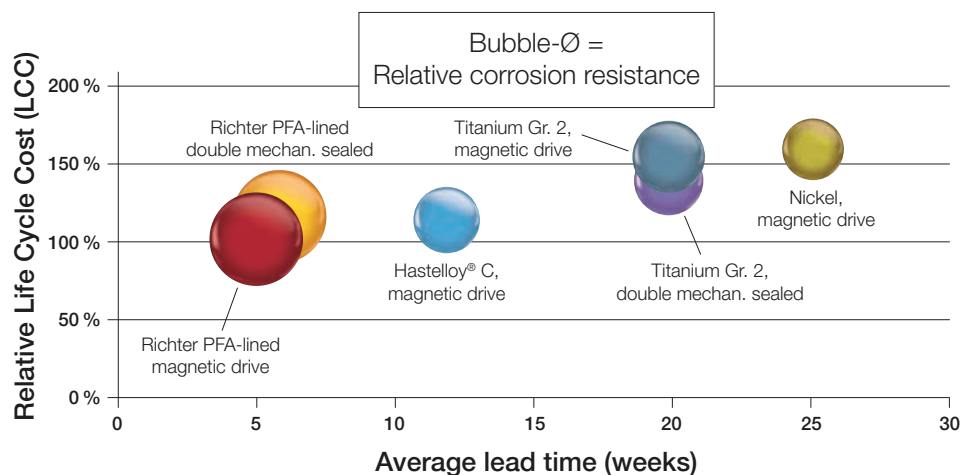
Cl₂ wet chlorine gas

NaOCl sodium hypochlorite

Reduce LCC life cycle cost: Richter's PFA/PTFE lined pumps increase plant availability and profitability

- Efficient and low NPSH hydraulics
- Magnetic drive pumps: No eddy currents, no waste of energy
- Sophisticated engineering for minimum need of maintenance
- Maximum MTBF for maximum plant availability

Relative positioning of highly corrosion resistant centrifugal process pumps by life cycle cost, corrosion resistance + lead time
(Basis: PFA-lined magnetic drive process pump RMI/RMA = 100 %)



Nickel and titanium pumps can cause 50 % higher LCC and have a much longer lead time!

Lined magnetic drive pumps

Almost all applications: purified, ultrapure, chlorinated and depleted brine, H_2SO_4 , HCl , $NaOH > 32\%$, $NaOCl$ and slightly solids laden fluids

- PFA/PTFE and PE-UHMW lined, non-metallic
- Flows to 600 m³/h (2650 USgpm), -60 to 200 °C (-75 to 400 °F)
- Dry-run proof SAFEGSLIDE® PLUS SSiC bearings
- Ideal for plant standardization through a minimum of different designs and brands
- No mechanical seal, thus almost no maintenance required
- Much better corrosion resistance than Duplex, Hastelloy®, titanium, nickel and much easier to handle than Si-cast (silicon cast iron) pumps

The globally most capable PFA/PTFE lined magnetic drive pump series!



Lined mechanically sealed pumps

Especially for solid-containing corrosives, but also for clean brines, acids, caustics

- Flows to 300 m³/h (1300 USgpm), -60 to 180 °C (-75 to 360 °F)
- PFA/PTFE and PE-UHMW lined
- Reliable long-life design
- Standard single shaft seal as well as complex flushed double mechanical seals
- Lower purchase cost than Hastelloy®, titanium and nickel pumps



Lined butterfly valves

Especially for purified, ultrapure, chlorinated and depleted brine, wet Cl_2 gas, H_2SO_4 , HCl , $NaOH > 32\%$, $NaOCl$

- Sizes to 1.000 mm (40") to ISO/DIN + ASME/ANSI
- PFA/PTFE and PE-UHMW lined, discs optionally stainless steel, Hastelloy, titanium Gr. 2 + 7
- -60 to 200 °C (-75 to 400 °F), specific chlorine versions
- Clean Air Act (German TA Luft) conformity
- Champion-like: 900.000 on-off cycles achieved with ClO_2 + $NaOH$ chemical waste water at 55-70 °C (130-160 °F)

Best of its class in 2 year test runs handling wet Cl_2 gas in a major European plant!



Lined shut-off + control ball valves

For all fluids within a chloralkali plant incl. wet and dry Cl_2 gas and liquid Cl_2 , except of raw brine with high share of solids

- Sizes to 200 mm (8") to ISO/DIN + ASME/ANSI
- -60 to 200 °C (-75 to 400 °F), maintenance-free stem seal
- Clean Air Act (German TA Luft)



Lined safety relief valves

Pressure safe-guarding of electrolysis cell rooms

- Set pressures from 100 mbar (0,145 psi) to 13 bar (190 psi)
- Bellows-sealed, -60 to 180 °C (-75 to 360 °F)
- Special chlorine service designs

The #1 PFA/PTFE lined safety valve worldwide!



Lined bellows-sealed flow control valves

Precise flow control of corrosive liquids and gases

- -60 to 200 °C (-75 to 400 °F), ISO/DIN + ISA/ANSI
- Hermetically tight, Clean Air Act (German TA Luft)
- Chloralkali tailored design, extra strong PTFE and Hastelloy bellows

The globally leading bellows-sealed PFA lined globe control valve!



Lined diaphragm valves

Shut-off and flow control of corrosive liquids and gases

- -60 to 150 °C (-75 to 300 °F), ISO/DIN + MSS/ANSI
- Hermetically tight, Clean Air Act (German TA Luft)
- Simple, cheap, reliable. Manual and remote-controlled.

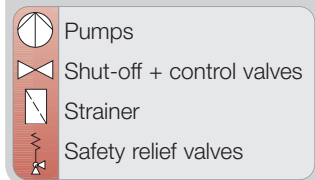


Lined pipeline strainers

Protect plant equipment from undesired solids in fluids, mesh sizes 85-2000 μm

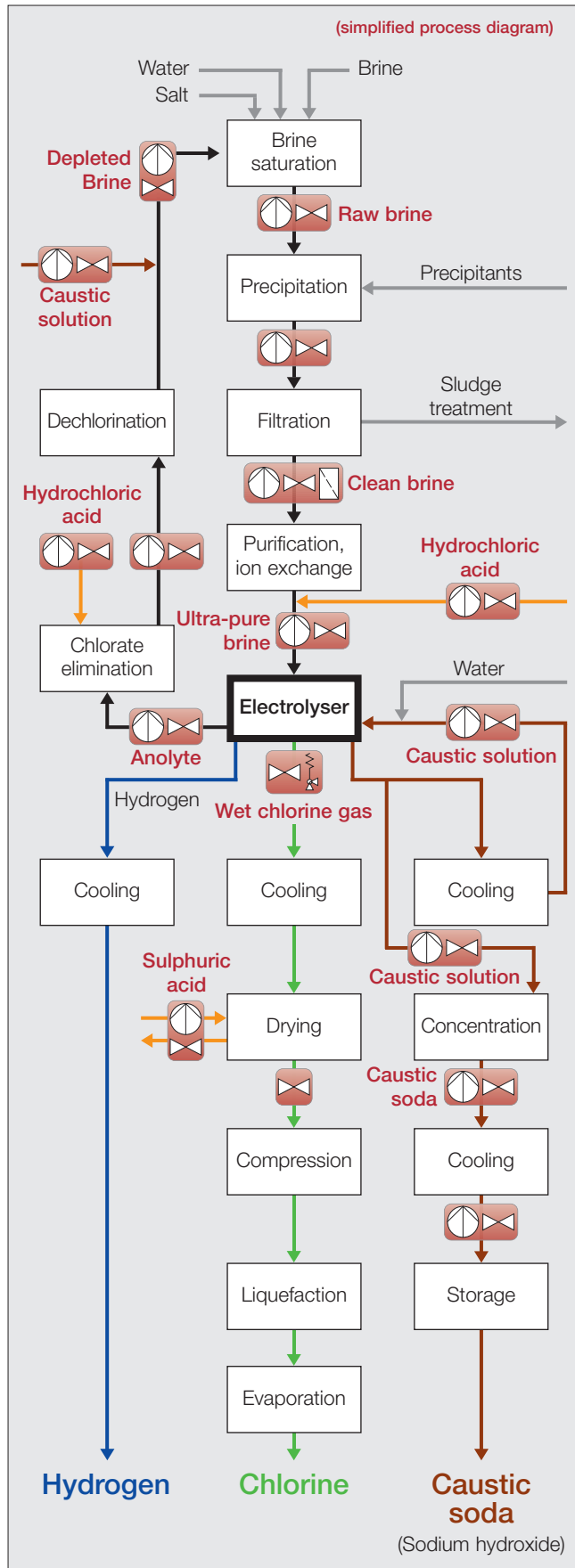
- -60 to 150 °C (-75 to 300 °F), ISO/DIN + ASME/ANSI
- Hermetically tight, Clean Air Act (German TA Luft)



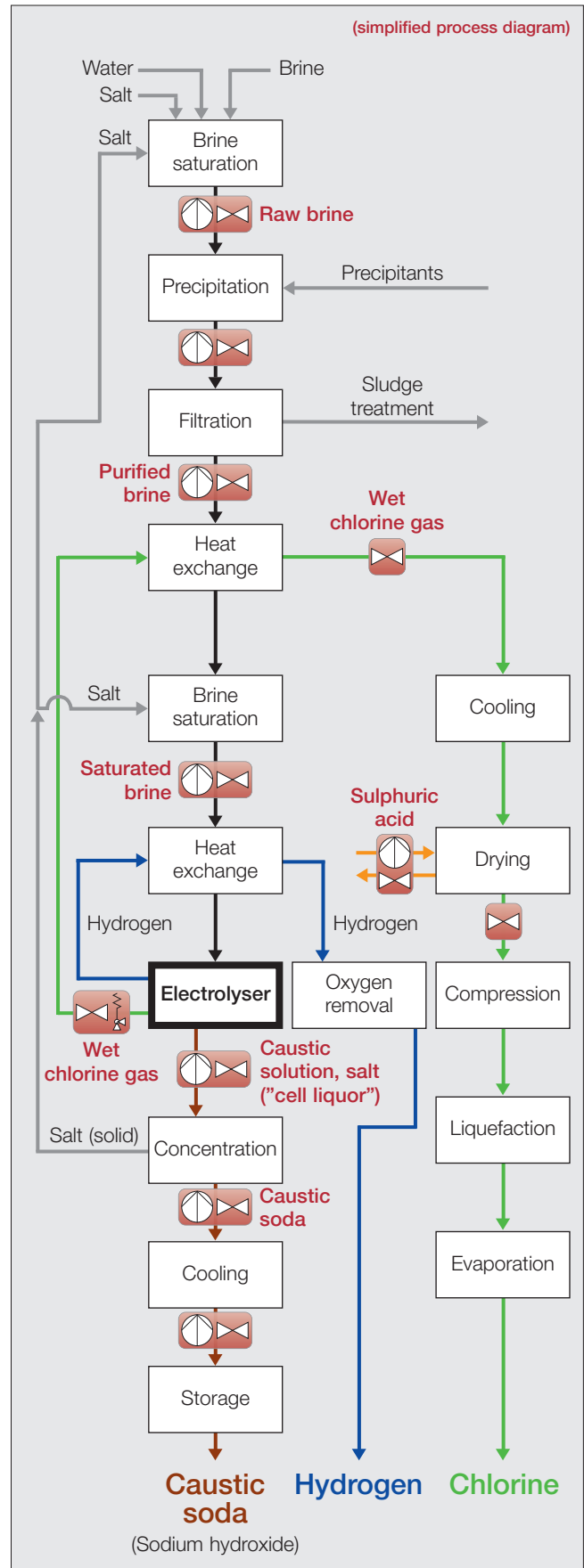


Richter pumps, shut-off, control and safety relief valves in ...

... Membrane Plants



... Diaphragm Plants



Why work with 4, 5 or more designs and brands each of pumps and valves? Less is more!

Standardize on fluoropolymer PFA/PTFE lined pumps + valves in chlor-alkali plants!

(instead of pumps and valves made of special metals)

Feature	Benefit	Note!
<ul style="list-style-type: none"> • Full chemical resistance to all fluids • Full temperature coverage • Choice of designs • Antiadhesive surfaces • Proven products, standard and customized • Chlor-alkali specific solutions 	<ul style="list-style-type: none"> • Handle almost all fluids • Single sourcing • Plant standardization • Reduced inventory • Increased flexibility 	<ul style="list-style-type: none"> • No need to differentiate between alloys, Ti, Ni, silicon cast iron, fibre-reinforced plastics • Much higher corrosion resistant than ETFE or PVDF
	<ul style="list-style-type: none"> • Significantly lower purchase cost than for special metals 	<ul style="list-style-type: none"> • Hastelloy * C = +25 % cost, Ti: +50 %, Ni: +100 % and volatile pricing
	<ul style="list-style-type: none"> • Significantly shorter lead times (also for spares!) 	<ul style="list-style-type: none"> • 2 to 6 weeks instead of 2 to 6 months, spares even faster

Standardize on sealless magnetic drive pumps in chlor-alkali plants!

(instead of mechanically or gland packing sealed pumps)

Feature	Benefit	Note!
<ul style="list-style-type: none"> • Hermetic tightness towards atmosphere • No efficiency disadvantage • Standard and customized solutions • Space-saving easy-to-install close-coupled options • Handle temperatures from -60 to +200 °C (-75 to +400 °F) 	<ul style="list-style-type: none"> • No emissions • Protection of plant, people, environment • Manage almost all applications, incl. solid containing fluids • Full flexibility from standard to harsh conditions 	<ul style="list-style-type: none"> • Richter lined mag drive pumps do not generate eddy currents, other than metal magnetic drive pumps • Generally Clear Air Act ("TA Luft") conform
	<ul style="list-style-type: none"> • Significantly lower life cycle cost "LCC" than with sealed pumps 	<ul style="list-style-type: none"> • Expensive seal flushing prevented • No need of seal maintenance

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Front page photo: courtesy of ThyssenKrupp Uhde GmbH, Germany



**Valve
& Automation**
Total Valve & Control Solutions®

JOHANNESBURG
Tel: 011 397 2833

DURBAN
Tel: 031 579 2593

South Africa:
0861 103 103

E-mail: sales@valve.co.za
www.valve.co.za



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