Safety valves and their application requirements

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Associazione Termotecnica Italiana

Associazione Italiana Strumentisti

ISA Italy Section

LESER

The-Safety-Valve.com

Objective of the presentation

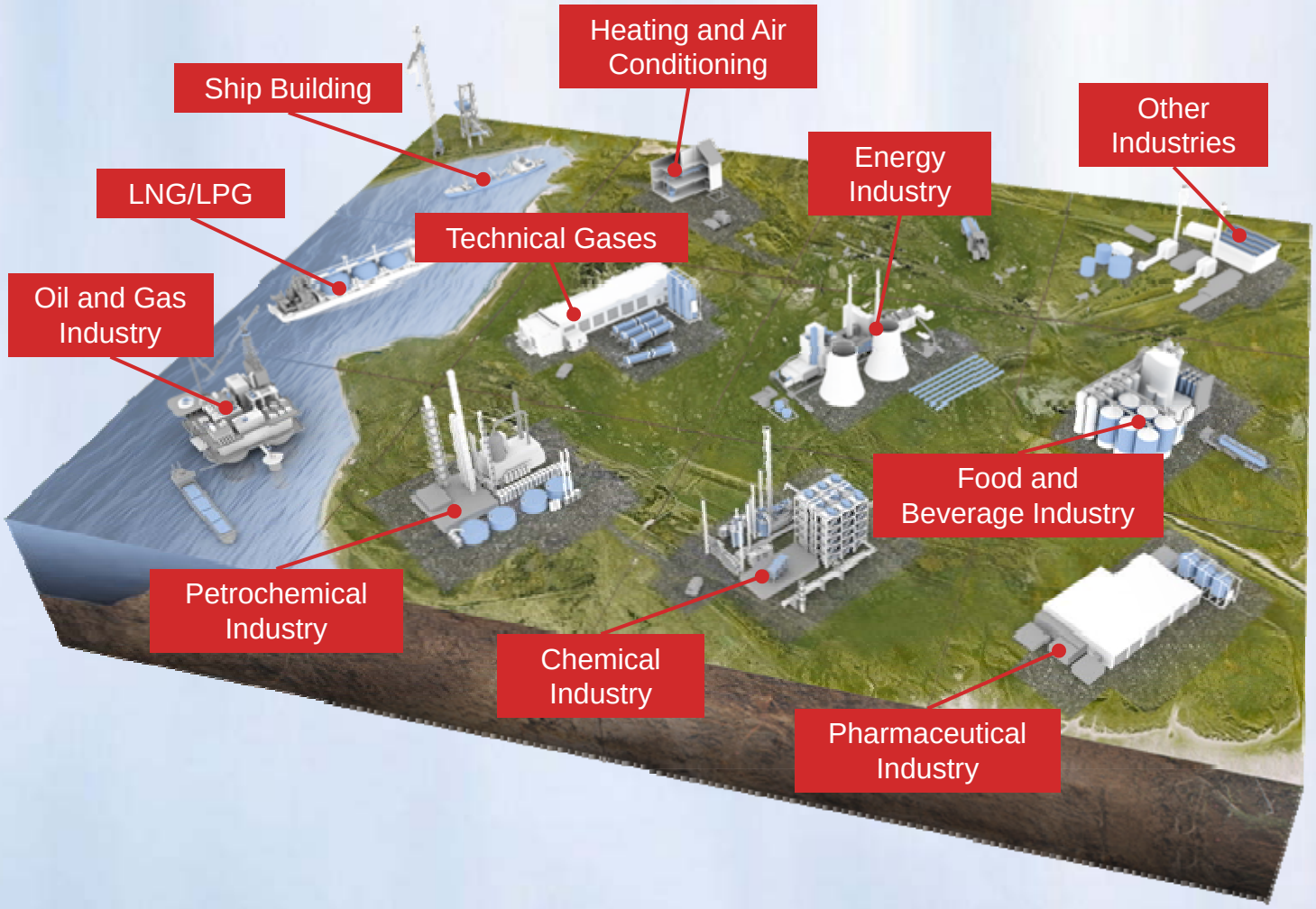
Show the complexity and how to handle it

The goal of this presentation is to provide an **overview** about the amount of **different applications** for Safety Valves and the **complexity of certain areas**.

Further it is described how this **variety and complexity can be handled** with a lean effective product management.

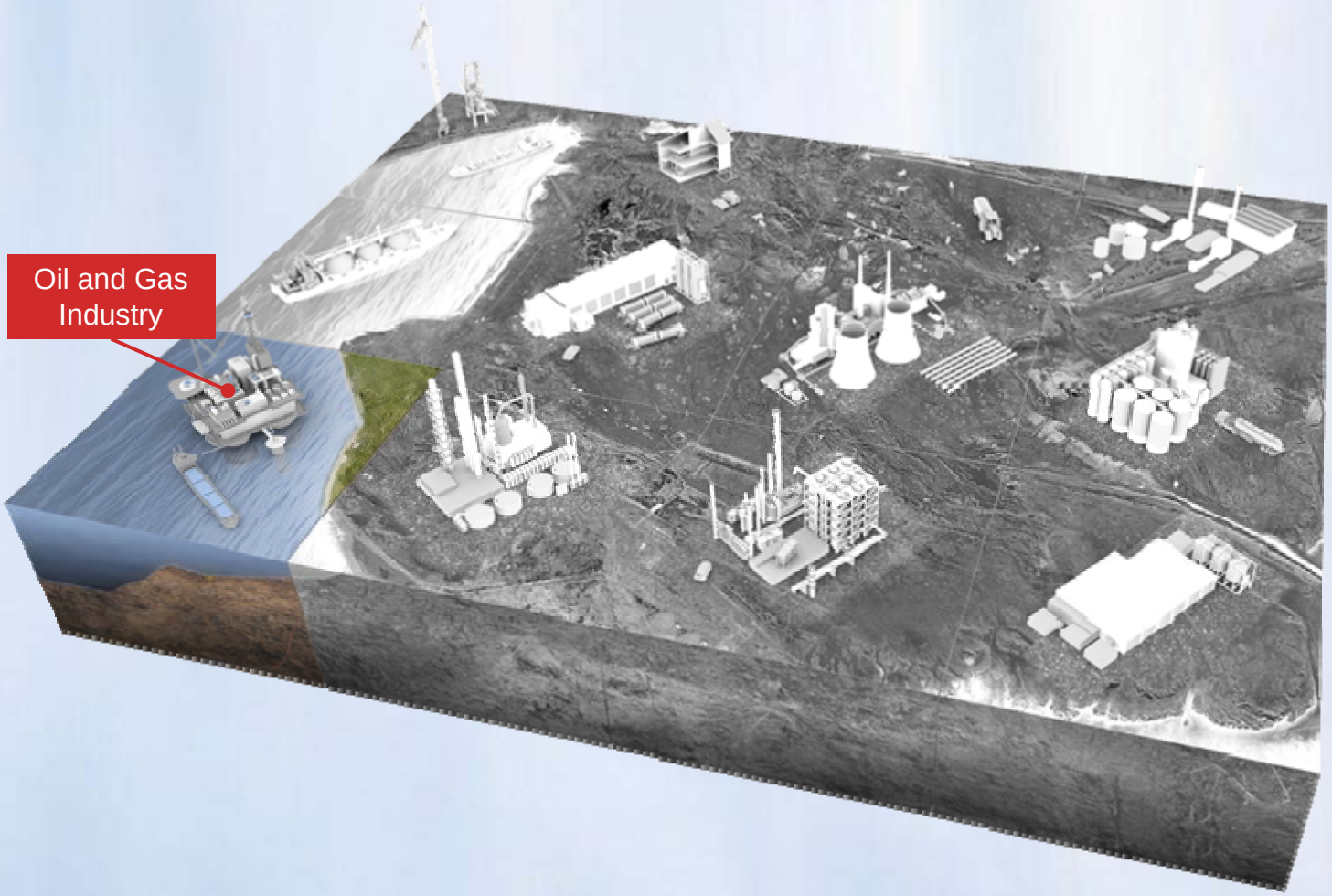
Application Areas

All fields of application for LESER safety valves



Oil and Gas Industry

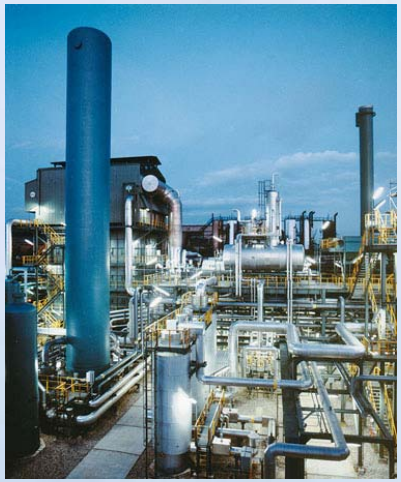
Upstream / Downstream



Oil and Gas Industry

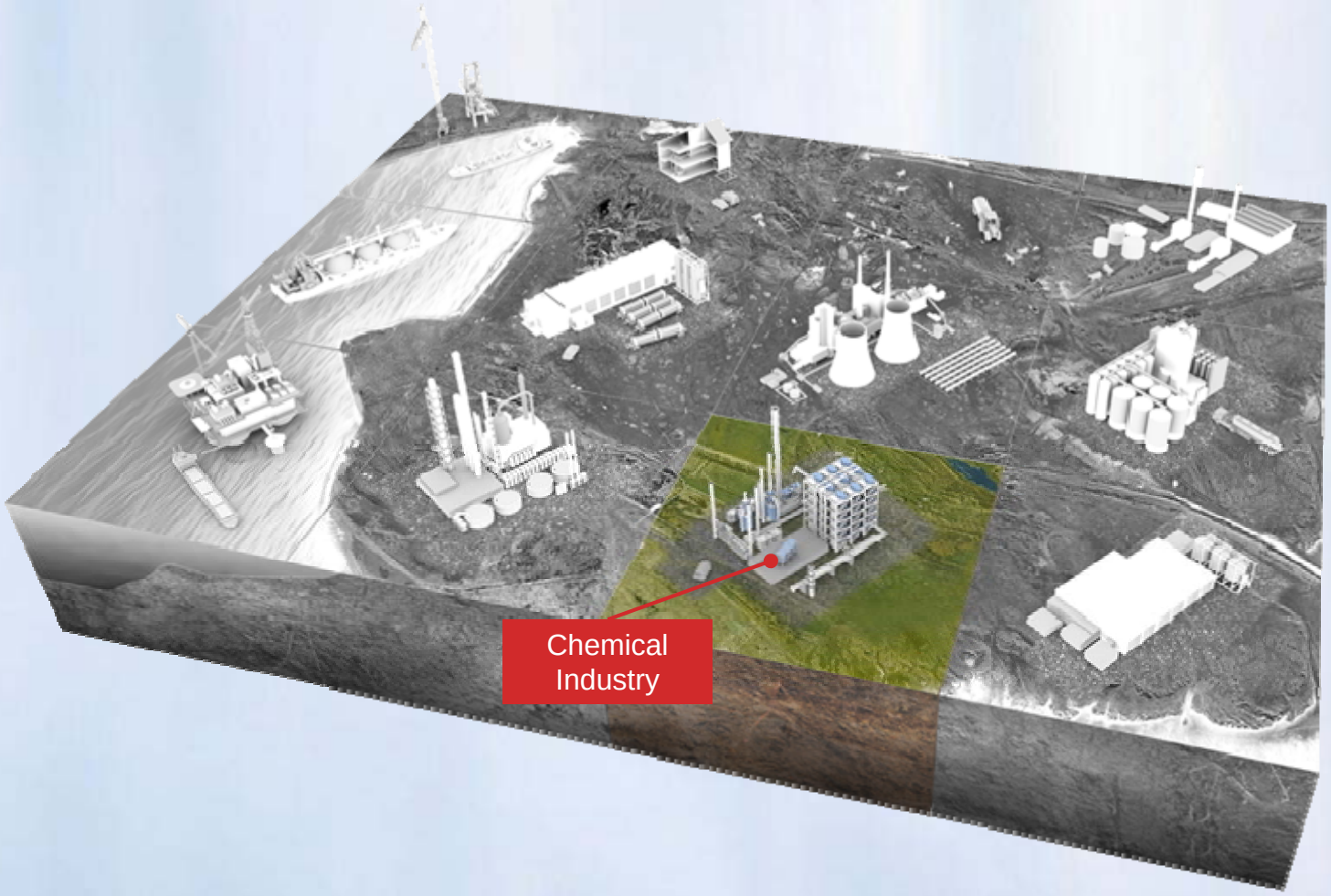
Upstream / Midstream / Downstream

The Oil and Gas industry including the midstream and downstream of refining and petrochemical industry is the biggest industry in the world for pressurized applications.



Applications	Requirements
■ Pressurized vessels ■ Thermal expansion in piping systems ■ Pressure-increasing stations ■ Christmas trees	■ High valve capacity at low weight and size ■ Corrosive environment (e.g. sea water) ■ High pressures and backpressures ■ Comprehensive documentation and customer-specific inspections

Chemical Industry



Chemical Industry

The Chemical industry has the highest demand for valves compared to the capacity in general and for overpressure protection devices as well.

Photos courtesy of Chemiepark Hoechst

Applications	Requirements
■ Pressurized vessels ■ Thermal expansion in piping systems ■ Pressure-increasing stations ■ Chemical reactors or autoclaves	■ Wide product range for gas, steam and liquid ■ Lower total costs of ownership and easy maintenance ■ Suitability for aggressive and toxic media

Chemical Industry

Urea Plants

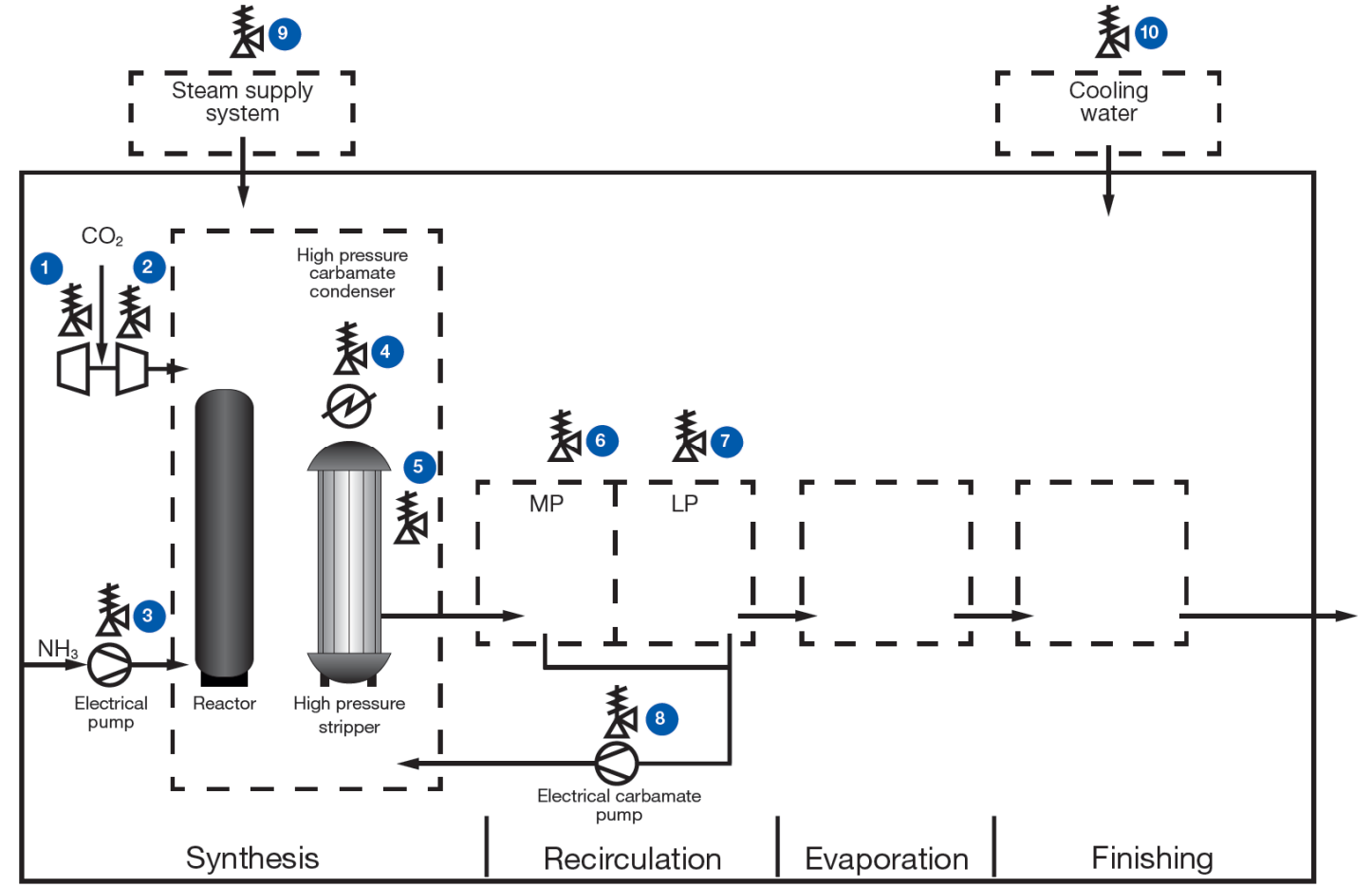
Urea plants are in need for solutions for the highly corrosive Carbamate in the synthesis reactor and its side processes like the carbamate pumps.

Applications	Requirements
■ Protection of the Urea Synthesis Reactor ■ CO2 – Compressor ■ NH3 - Pump (liquid) ■ Stripper ■ Recirculations	■ Prevention of corrosion ■ Prevention of crystallisation of the carbamate ■ High set pressures ■ High temperatures

Chemical Industry

Urea Plants

Setup of a Urea plant:



Pharmaceutical Industry

Pharmaceutical Industry

The Pharmaceutical Industry has a lot of special **requirements regarding the cleanability, materials and documentation**.

Applications	Requirements
■ Pressurized vessels	■ Excellent cleanability
■ Piping systems	■ Regulation-compliant materials
■ Reaction vessels	■ Wide range of aseptic connections
■ Filling stations	

Approach to handle the diversity

1. Different products (**Product Groups**) with specific characteristics.

2. Various standardized **options** to create a specific product for the most common demands.

3. Dedicated **concepts** to individualize the product further for specific industry requirements.

4. Complete **applications based** product **solutions** for certain areas with very specific requirements.

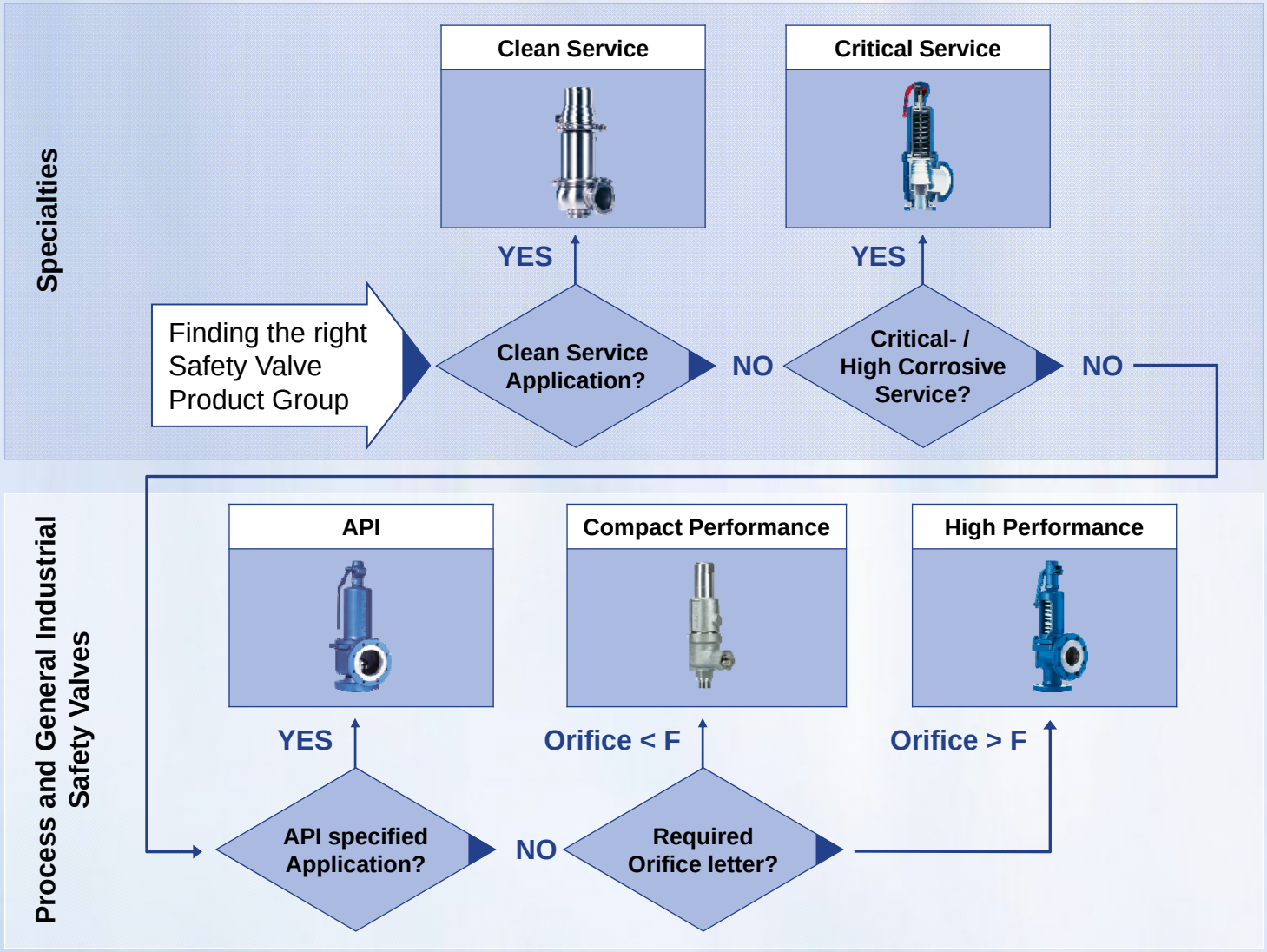
5. **Design** and **source to order** capabilities for requirements which cannot be covered by the first four bullet points.

Nine product groups up to DN 400 / 16" and 850 bar / 12.000 psig

General industrial applications (chemical, petrochemical, oil & gas, technical gases, LNG / LPG, marine)					
Product Group	High Performance	API	Compact Performance	High Efficiency Pilot-operated safety valve	Modulate Action
					
Short description	Flanged safety valves with especially high capacity for their size	Flanged safety valves that meet all the requirements of API 526	Threaded and flanged safety valves with compact dimensions	Pilot-operated safety valves for optimal tightness right up to set pressure.	Flanged valves with a standard or proportional opening characteristic.
Nominal Diameter at Inlet	DN 20 - DN 400 3/4" - 16"	DN 25 - DN 200 1" - 8"	DN 15 - DN 40 3/8" - 2"	DN 25 - DN 200 1" - 8"	DN 15 - DN 150 1/2" - 6"
Pressure	0.1 - 300 bar 1.5 - 4,350 psig	0.12 - 413.8 bar 2 - 6,000 psig	0.1 - 850 bar 1.5 - 12,328 psig	2,5 - 426 bar 36 - 6,170 psig	0.2 - 160 bar 2.9 - 2,320 psig

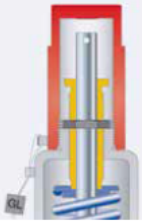
	Special industrial applications					
Product Group	Clean Service	Critical Service	High Efficiency Suppl. loading	Best Availability Change-over v.	Best Availability Bursting discs	S&R
						

Valve Finder ASME for spring loaded safety valves



Options

Screwed cap H2
H2

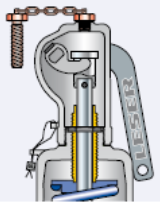


Packed lever H4
H4

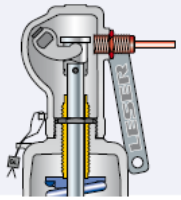
Plain lever H3
H3

Open bonnet
See Art. No.

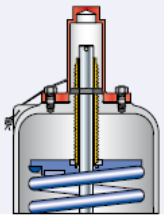
Test gag
J69: H4 K05: H1
J70: H2 K27: H6



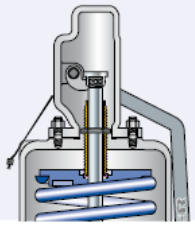
Lift indicator
J39: Adaptor for lift indicator H4
J93: Lift indicator



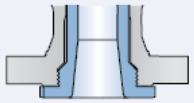
Bolted cap H1
K01



Bolted lifting device H6
K06

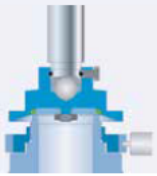


Flange drillings
acc. to DIN EN 1092-1

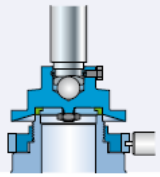


Outlet flange rating class 300

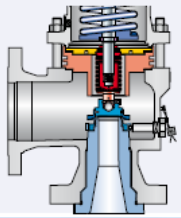
O-ring disc
J21: CR "K"
J22: EPDM "D"
J23: FKM "L"
J20: FFKM "C"



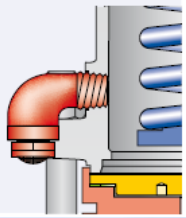
Disc with inserted sealing plate
J44+S07: PTFE-FDA "A"
J48+S07: PCTFE "G"
J49+S07: SP "T"



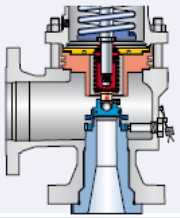
Inconel bellows
J83



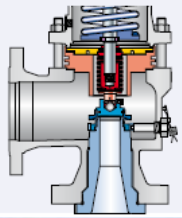
Bug screen
M70



Conversion kit for balanced bellows



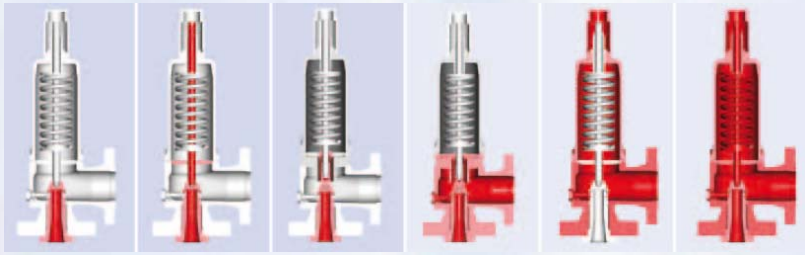
High temperature equipment
J88



Over 2 Million different configurations are possible.

Specific concepts for critical applications

1. Alloy concept



2. Corrosion protection

3. NACE

4. Emission concepts

Alloy concept application examples

Oil and Gas Industry Onshore / Offshore:

- Corrosive **marine environment**
- Corrosive **media: sea water**
- Corrosive **media**: Hydrocarbons with **H_2S** (NACE) and **sea water**
- Platforms, FPSOs, OEMs, e.g. pumps, compressors for above mentioned applications

Industrial Gas Industry, Air separation:

- Oxygen service at higher pressure
- Nozzle & disc in Monel 400

FPSO

Plunger pump for oilfield applications

Air separation plant

Alloy concept design

Type 526 Alloy Level Concept

Level system for economic solutions according to application requirements

Level 1.0	Level 2.0	Level 2.1	Level 3.0	Level 4.0	Level 5.0
					

- Level 1: Inlet wetted
- Level 2: Inlet wetted & trim
- Level 3: Inlet & outlet wetted
- Level 4: Valve external
- Level 5: Complete valve

Alloy concept benefits

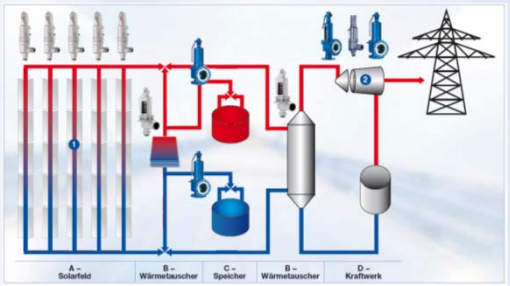
- Economic solutions in Duplex and high-alloyed materials according to application requirements
- Defined material specifications in accordance with relevant codes and standards
- Short delivery time
- Easy configuration & ordering

Part	Materials	Delivery time
Body	CF3M	24 weeks
	22Cr Duplex - CD3MN 25CR Super Duplex - CD3MWCuN Monel – M35-1 Hastelloy C22 - CX2MW Inconel 625 - CW-6MC	15 weeks
Nozzle Disc Guide Spindle	22Cr Duplex - F51, S31803 25CR Super Duplex - F55, S32760 Monel 400 - SB-164, N04400 Hastelloy C4 - SB-574, N06455 Inconel 625 - SB-446, N06625	8 weeks
Bellows	Inconel 625 / 316L Hastelloy C276 / Hastelloy C4	4 weeks 4 weeks
Spring	Inconel X-750	5 weeks

Specific solutions for critical applications

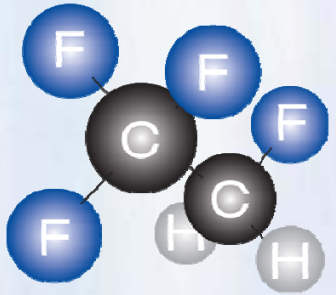
1. Urea

2. Solar



3. Tank farms

4. Refrigeration



5. FPSO

Application Examples Urea

Protecting corrosive media with a tendency for crystallization (e.g. in the synthesis section of a urea plant).

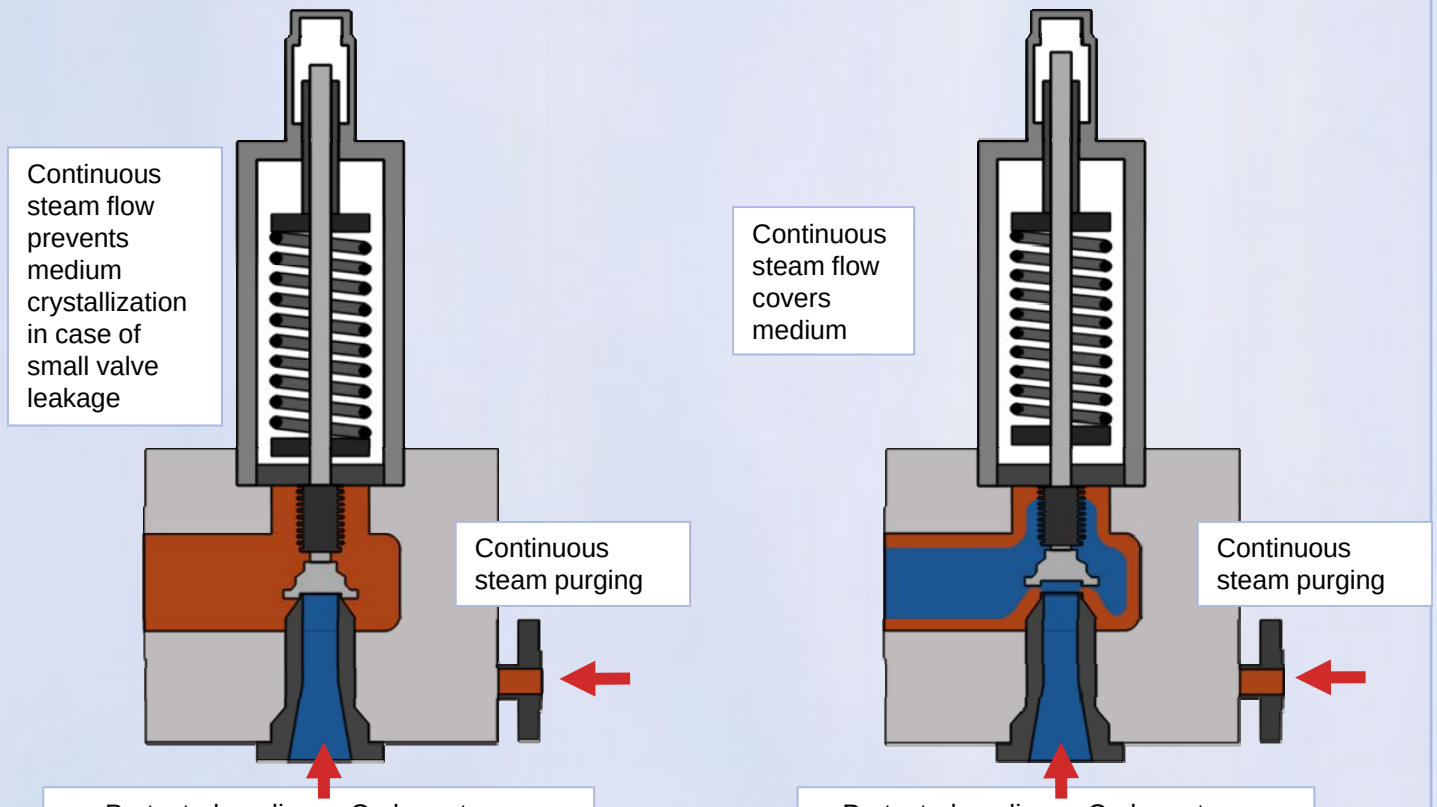
Urea plant example :

- Protected medium: Carbamate gas
- Typical pressure / temperature: Up to 170 bar / up to 190° C (depending on licensor)
- Typical safety valve: API 526 3x4 with heating jacket, necessity for an individual check is dependent on plant capacity.
- Typical materials: Carbamate corrosion resistant materials (e.g. 316L UG, 1.4462, 1.4466, SAFUREX©)
- Typical challenges for safety valve: danger of carbamate crystallization and corrosion requires e.g. steam purging
- Further process optimization: Supplementary Loading System

Design

Safety Valve Technology for Urea Synthesis Section

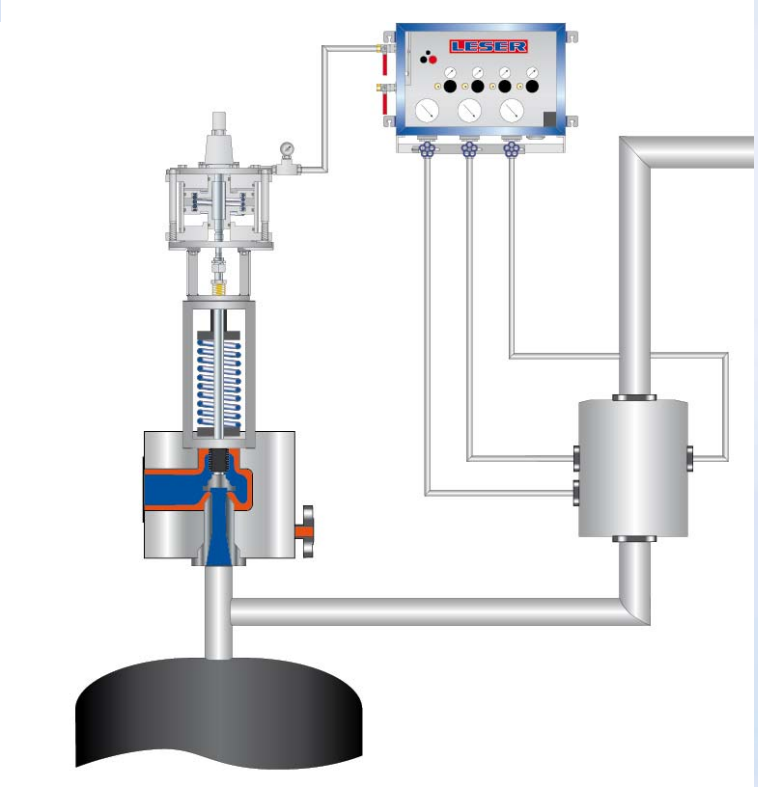
Closed position	Open position



Material	316L Urea Grade	1.4466 – UNS 31050	1.4462 – UNS 31803	SAFUREX – UNS 32906

Design

High-end LESER Safety Valve technology with a Supplementary Loading System for the Urea Synthesis Section

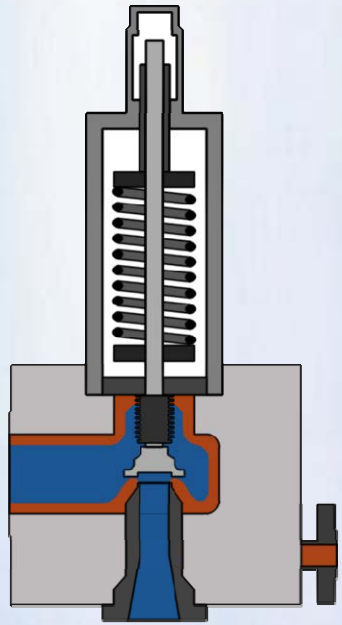


- Main components are:
  Safety valve, actuator, control unit
- Improves the opening and closing characteristics of a safety valve
- Customer-optimized Supplementary Loading System uses pressure transmitters located directly on the protected system.
- Approved by TUV Nord authorities in Germany and PED / ISO 4126-5.

Benefits

Urea Synthesis Design

Feature	Benefit
Special stainless steel grades	Longer (2-3x) service intervals
Minimized steam requirement	Reduced operating costs
Only one injection point	Less piping needed
Continuous steam purging	▪ Prevents crevice corrosion and crystallization in outlet body ▪ Ensures media temperatures stay above critical 142° C.



Source: LESER

Engineering capacities and Supply Chains

Order value in %	Customer need	LESER supply chain	Engineering capacities
60%	Standard delivery in 2-4 weeks ex works, convenient and comfortable ordering	Eco line	Low Engineering capacities only sizing and chossing of right product plus options or application solution
30%	Quick delivery from local stock	Project line	Engineering capacities needed during offer (Technical Sales)and order process (Design Center)
1%	Quickest delivery (Emergency)	Fast Track Order	Standard products plus options only

Summary

- The amount of pressurized applications and industries is quite extensive.
- The requirements and demands to fulfill the main task of overpressure protection are differing.
- With a certain product structure it is possible to handle the requirements reliable, repeatable and economically.