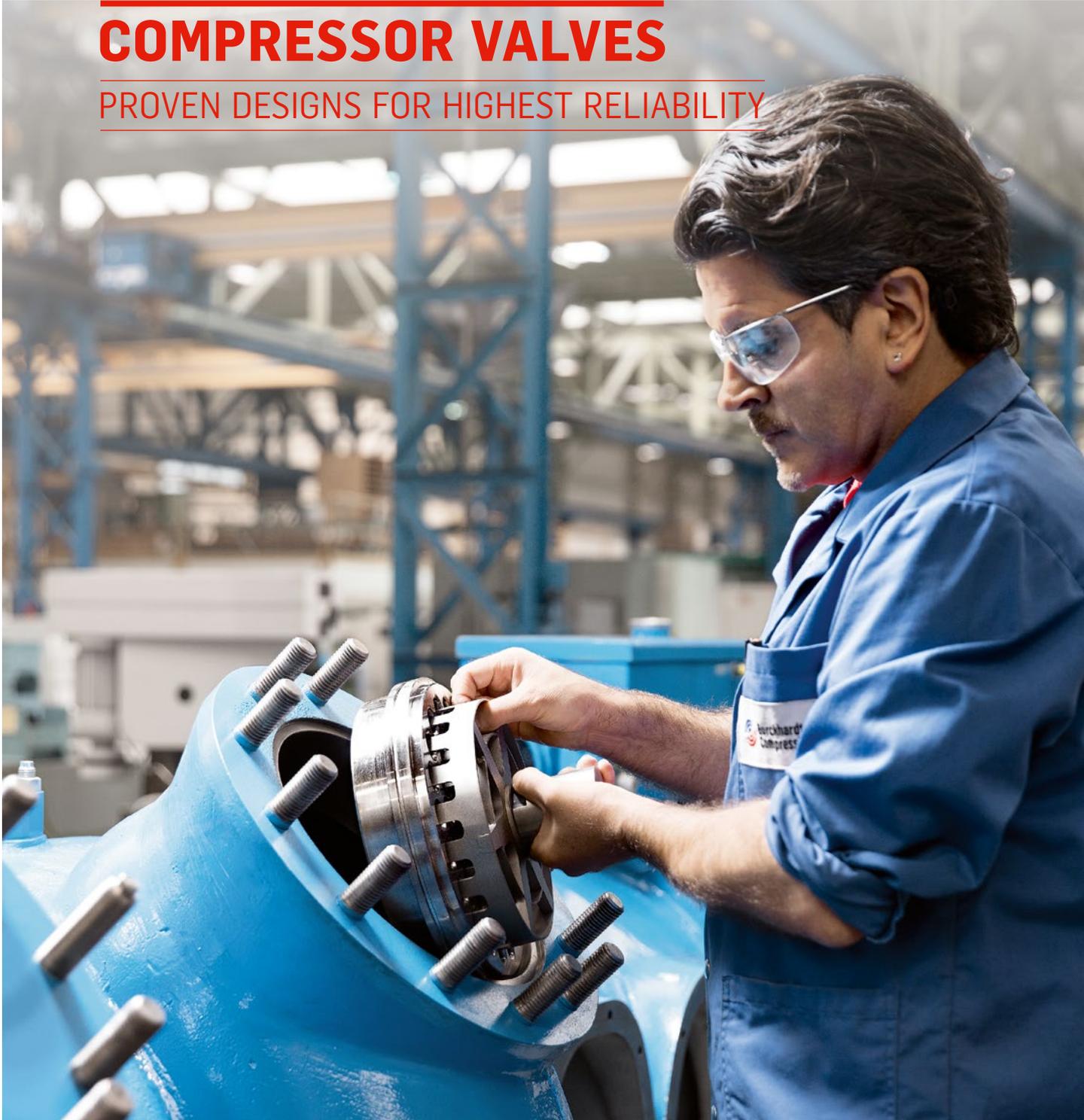


COMPRESSOR VALVES

PROVEN DESIGNS FOR HIGHEST RELIABILITY



Compressors for a Lifetime™



“If you have a compressor problem, call Burckhardt Compression. They’ll make sure that your system is up and running again in no time. We were impressed with the professionalism of their highly experienced compressor specialists and trust them completely because they speak the OEM language.”

Serge Mabboux, Rotating Equipment Specialist, VARO Refining Cressier, Switzerland

OUR VALVE TECHNOLOGY

BEST PERFORMANCE AND LONGEST MTBO

WHY BURCKHARDT COMPRESSION

Burckhardt Compression is the market leader in the field of reciprocating compressor systems and the only manufacturer that offers the complete range of reciprocating compressor technologies: Process Gas Compressors API 618, Hyper Compressors, Laby® (Labyrinth Piston Compressors), Laby®-GI Compressors and Standard High Pressure Compressors.

Since our origins in the 19th century we have focused on building reciprocating compressors with the longest MTBO (mean time between overhaul) and the lowest operating costs. We have mastered every stage of the production process and are continuously enhancing key components and materials as well as the associated technology.

Due to the fact that valves are amongst the most heavily stressed compressor components and can limit the availability and reliability of the entire compressor, they are one of the most important aspects of our activities. With our invaluable OEM knowledge and compressor experience, we can provide reliable solutions for extremely demanding applications, ranging from very clean industrial to highly contaminated process gases.

The solutions Burckhardt Compression offers meet demanding design guidelines such as:

- API 618
- Shell Dep
- NACE
- Individual customer specifications

OUR COMPETENCIES

We supply our customers with top performing compressor valves and valve services for a vast range of applications and any compressor brand, with the goal of steadily minimizing the life cycle costs and optimizing the efficiency of reciprocating compressors.



OUR OFFERING



UPGRADE/
OPTIMIZATION/
MODIFICATION



PARTS REPLACEMENT
FOR ANY COMPRESSOR
BRAND



REPAIR OF DAMAGED
COMPONENTS



RECONDITIONING OF
THE WORN PARTS



RETROFIT/REVERSE
ENGINEERING



CUSTOMIZED
IN-HOUSE AND
ON-SITE TRAINING

INNOVATION AND DEVELOPMENT

YOUR PARTNER FOR THE ENTIRE LIFE CYCLE

A VALUABLE PARTNERSHIP

Together with our customers we brainstorm new ideas and use our expertise to fulfill market requirements. We can learn from each other and develop solutions for challenging applications. Our relationships with customers often become a true partnership. This puts us in a position to test new components, materials and solutions together under real life conditions and to set up reference installations. Both parties clearly benefit and gain valuable experience from this partnership.

SYSTEMATIC DEVELOPMENT APPROACH

The growing number of players in our increasingly crowded marketplace means that we need to compete not just through innovation and product differentiation but also through service excellence. Unlike a components manufacturer or a mere service provider, we see the full picture of a compressor system. Having access to Burckhardt Compression's knowledge as an OEM manufacturer allows us to fully understand market trends and demands.

Burckhardt Compression is well experienced in product development and has used a stage-gate process for a number of years. This systematic approach is also implemented for components development to strengthen our ability to provide customer-oriented solutions.

In order to set new standards we operate in-house laboratories where we develop new materials and technologies to meet challenging customer specifications. In our testing facilities we have the possibility to perform long-term tests on our own compressors and other proprietary testing equipment.

MATERIAL DEVELOPMENT

The sealing element material has a significant impact on the extended lifetime of modern compressor valves. We select the optimal sealing elements for our Burckhardt Poppet Valve™ and Burckhardt Plate Valves™, taking into consideration the process gas composition, the compression temperature and the operating pressure.

Our valve materials are constantly being improved through internal projects and in collaboration with our long-standing suppliers. We are able to analyze material properties from a probe body in our Research & Development laboratory as well as in a test rig with a real valve geometry. Further testing of new materials is carried out during customized test cycles with our six test bed compressors. The focus of our material development activities is on extending the applicable temperature range and the chemical resistance while maintaining excellent impact strength.

DESIGN OPTIMIZATION FOR OPTIMAL PERFORMANCE

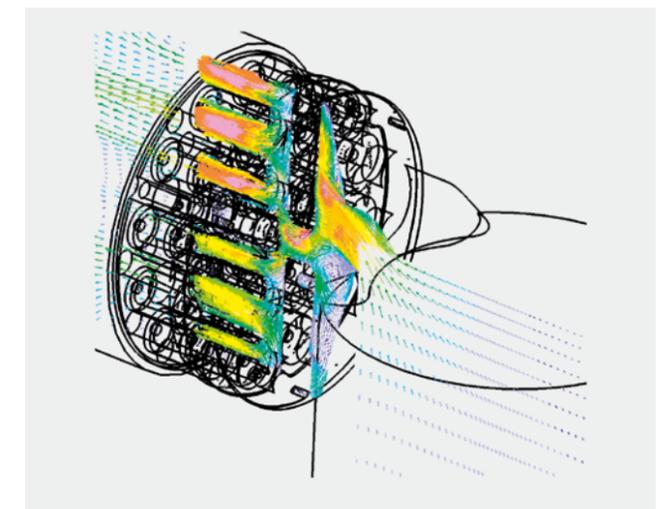
Experimental results from our in-house test facilities and cooperation with research institutes are combined with 3D-CFD (Computational Fluid Dynamics) simulations to optimize valve performance. This is done without compromising the lifetime of the sealing elements. One example of our research findings is that the lower the pressure loss through the valve, the greater the effect of interaction between the cylinder geometry and the valve.

The flow through the valve pocket influences both valve performance and valve dynamics. Therefore, we optimized our valves to cope with the uneven flow in a cylinder. Our Burckhardt Poppet Valve™ tolerates uneven flow thanks to its autonomous sealing elements.

The analysis of the flow field in many compressor geometries revealed that the valve flow area in the center of the valve often contributes the most to the total flow through a compressor. Therefore we came up with a poppet valve that has no central bolt, which frees the most critical space of the valve for additional flow.



A good customer relationship and trust are key factors for a valuable partnership.



HIGH PERFORMANCE VALVES FOR EVERY APPLICATION

MARKET SEGMENTS



- Upstream oil & gas
- Gas transport & storage
- Refinery
- Petrochemical/Chemical industry
- Industrial gases
- Food & beverage industry
- Wood & charcoal industry
- Mining industry
- Power stations
- Hydro-electric power plants
- Nuclear power plants

GASES



- Hydrogen, nitrogen, argon, helium
- Hydrocarbons, ethylene, ethylene oxides
- Chlorine, ammonia
- Air, oxygen
- Nitrous oxides, carbon dioxide, carbon monoxide, sulfur dioxide
- Hydrogen sulfide, hydrogen chloride, sulfur hexafluorides, vinyl chlorides
- Gas mixtures and flare gases

COMPRESSOR DESIGNS



- Process Gas Compressors API 618
- Labyrinth Piston Compressors
- Lubricated and non-lubricated
- Cooled and non-cooled
- Horizontal, vertical and inclined

APPLICATION ENGINEERING TAILOR-MADE VALVE DESIGN FOR BEST PERFORMANCE

VALVE DESIGN

One of our main assets is our excellent experience in application engineering. Close contact with our customers and awareness of the challenges they face are reflected in our capabilities:

- The valves are carefully selected and engineered for best performance with highly sophisticated compressor sizing software (RecipCalc™)
- Flexible and swift modeling using the latest CAD software
- Application-specific material selection
- Optimization of valve performance and running time based on actual compressor operating data, our field references and our years of experience
- Evaluation and approval of the structural strength of the main parts using the latest FEA method
- Support and consultation for all valve issues, including root cause analysis for any valve failure, modifications and improvements of existing valves by experienced valve application engineers



MATERIALS

The valve body parts are made of standard material X12 stainless steel (AISI 416). Other proprietary materials are available on request.

Burckhardt Poppet Valve™

- High performance thermoplastic polymers (e.g. PEEK and polyamide with appropriate fillers)
- Filled PTFE for cryogenic applications and for compressing highly aggressive gases

Burckhardt Plate Valve™

- Premium grade X5 stainless steel (AISI 630)
- Hastelloy C276 for very corrosive environment
- High performance thermoplastic polymers (e.g. PEEK and polyimide with appropriate fillers)

Burckhardt Concentric Valve™

- High grade X20 stainless steel (AISI 420)
- High performance thermoplastic polymers (e.g. PEEK and polyimide with appropriate fillers)



Our valve application engineers can help you in root cause analysis for any valve challenges, modifications and improvements of existing valves, upgrades and conversion.

VALVE PORTFOLIO

THE PERFECT FIT FOR EVERY REQUIREMENT

BURCKHARDT POPPET VALVE™



BURCKHARDT PLATE VALVE™

METALLIC PLATE

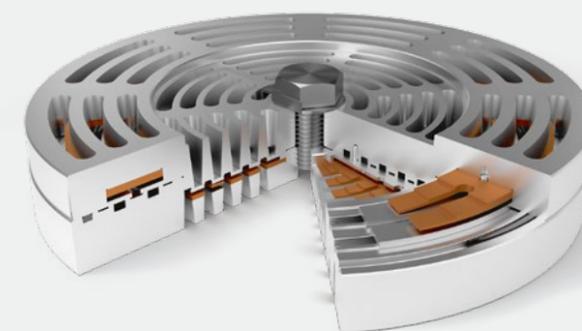
NON-METALLIC PLATE



“We are very satisfied with the performance of the Burckhardt Poppet Valve™. After installing these valves, we have never had an unscheduled shutdown of the machine due to valve failure. It’s also great how they lower the overhaul cost of the valves and we like the fact that we don’t have to send the valves off-site for overhaul.”

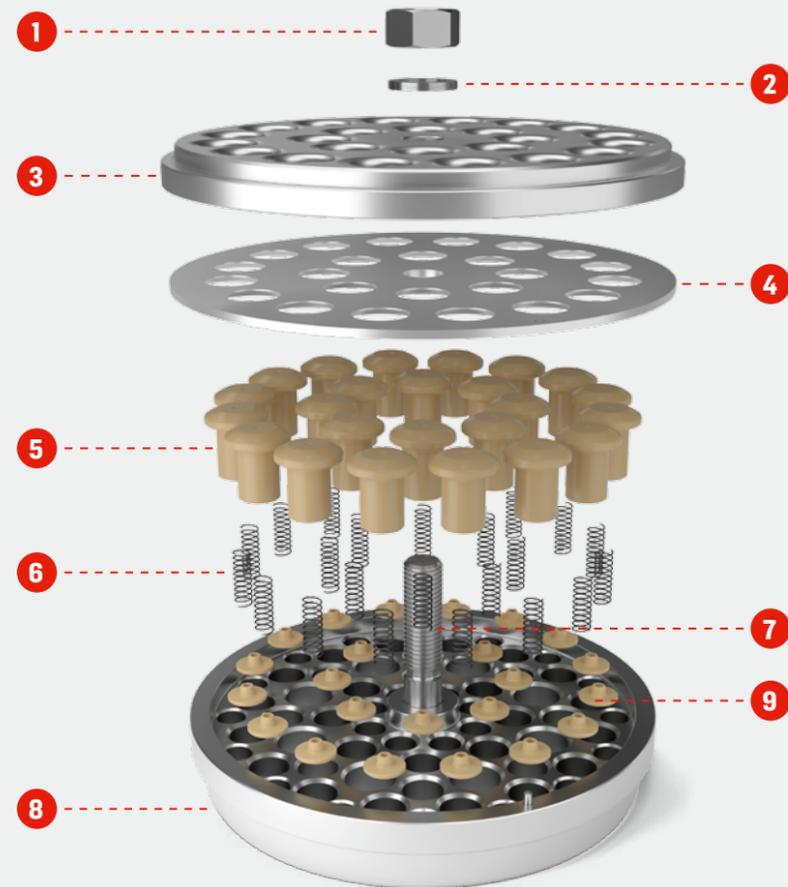
Richard Hallberg, Rotating Equipment Manager, Perstorp Oxo, Sweden

BURCKHARDT CONCENTRIC VALVE™



BURCKHARDT POPPET VALVE™

SMART CHOICE – REDUCE OPERATING COSTS



- | | | | |
|----------------------------|---------------------------------|--------------------------|---------------------------------------|
| 1 Nut | 4 Replaceable seat plate | 6 Waisted springs | 9 Spring supports/lift washers |
| 2 NORD-LOCK® washer | 5 Poppets | 7 Center bolt | |
| 3 Valve seat | | 8 Valve guard | |

CHARACTERISTICS

The Burckhardt Poppet Valve™ performs excellently in demanding applications with gases containing oil and particles as well for clean gases like oxygen. The optimized flow area results in less pressure drop and increased efficiency. Furthermore, the design allows for easy maintenance and offers significant advantages as follows:

Maintenance

- Valve service without special tools, reconditioning can be done on the spot
- No need for specially trained people to perform valve service
- Re-profiling of valve seat not required thanks to the replaceable seat plate

Performance

- Outstanding performance with contaminated gases, less oil stiction
- Insensitive to different thermal expansion and humidity in the gas
- Less clogging than plate valves for dirty or wet gases
- Improved aerodynamic flow path leads to lower pressure drop and higher efficiency

Safety

- Lower noise emissions and reduced vibrations achievable
- Less sensitive to variable operating conditions
- Minimized risk of secondary damage to the compressor parts in case of a failure
- The metallic springs are protected from gas stream by the non-metallic poppet body

TECHNICAL DETAILS

- Compressor speed max. 1'000 rpm
- Pressure difference max. 170 bar / 2'466 psi
- Temperature range from –200 to +220 °C / –328 to +428 °F
- Diameter dimensions min. 40 mm / 1.57 in, max. 383 mm / 15.08 in



Reconditioning on the spot – fast and simple maintenance – no need for special tools



BURCKHARDT PLATE VALVE™

LONG RUNNING VALVE WITH PROVEN PERFORMANCE



CHARACTERISTICS

The Burckhardt Plate Valve™ is of proven design, and has been continually optimized over the years. Special care has been given to improve the robustness and longevity of the valve plate, damper plate and the springs under challenging operating conditions.

Main advantages are the following:

- Frictionless guided metallic and non-metallic valve plates for minimum wear and longest lifetime
- Up to 20 revisions of valve seat achievable, therefore very low life cycle costs
- Springs are fixed in the guard to achieve almost no spring wear
- Unequaled valve plate lifetime through careful material selection and special heat treatment. High grade X5 stainless steel is chosen as the standard material for metallic plate valves
- Lowest possible leakage rates thanks to a premium surface refinement
- 100% quality control: Every single metallic valve plate is leakage tested with a proprietary procedure

With non-metallic plates the following additional advantages apply:

- Higher ductility results in better impact properties
- More resistance to damage from liquids and debris
- Reduced wear on seat and guard during normal operation
- Greatly reduced secondary damage to other cylinder components in case of failure

TECHNICAL DETAILS

- Compressor speed max. 1'800 rpm
- Pressure difference max. 200 bar / 2'900 psi
- Temperature range from -200 to +250 °C / -328 to +482 °F
- Diameter dimensions min. 68 mm / 2.68 in, max. 383 mm / 15.08 in



**Conversion from metallic
to non-metallic possible
without additional machining**



BURCKHARDT CONCENTRIC VALVE™

COMPACT AND COMBINED VALVE



- 1 Center bolt
- 2 Locking plate/NORD-LOCK® washer
- 3 Suction seat
- 4 Spring plates
- 5 Discharge valve plate/ring
- 6 Suction valve plate
- 7 O-ring
- 8 Discharge seat

CHARACTERISTICS

The Burckhardt Concentric Valve™ is a combination of a suction and discharge valve, which makes it compact and space-saving with the lowest possible clearance volume.

Standard valves for wide application range.

- Fast availability and low stock in a plant with several compressors with different speeds
- Pre-defined by cylinder configuration and gas composition
- Valves are available with metallic and non-metallic plates
- Easy to assemble and disassemble
- Lowest possible leakage rates thanks to a proprietary surface refinement
- Unequaled valve/spring plate lifetime through careful material selection and special heat treatment

TECHNICAL DETAILS

- Compressor speed max. 1'500 rpm
- Pressure difference max. 250 bar / 3'626 psi
- Temperature range from –40 to +250 °C / –40 to +482 °F
- Diameter dimensions min. 60 mm / 2.36 in, max. 250 mm / 9.84 in



**The perfect fit for
your Standard
High Pressure Compressor**

CAPACITY CONTROL

SAVE ENERGY AND REDUCE EMISSIONS

BENEFITS OF CAPACITY CONTROL

Capacity can be controlled in a reciprocating compressor using different technologies: Bypass control, Speed control, Valve unloading (Stepwise and Stepless), Clearance pockets and suction pressure reduction. Burckhardt Compression specializes in all of the above mentioned capacity control systems, but the most important capacity control methods are the following:

Conventional Valve Unloading (Stepwise control)

- With piston type actuators (spring or medium actuated)
- Cost-efficient on/off regulation of compression chambers
- Very low maintenance costs
- Highly reliable and easy to maintain
- Longest MTBO of valve and unloader

ExcelFlow® (Stepless control)

- Fully electromagnetic system
- An optimal combination of different control strategies and control systems
- Very fast and flexible solution
- Wide control range and high savings potential
- Only the required gas is compressed
- Oil-free actuators use patented frictionless bearings
- Possible combination with conventional unloaders

YOUR BENEFIT

- Fast return on investment
- Reduced energy consumption
- Provide support during start-up of compressor
- Retrofit/Upgrade any existing compressor
- Process parameters such as pressure and temperature can be controlled



- 1 Conventional Valve Unloading (Stepwise control)
- 2 ExcelFlow® (Stepless control)

MANUFACTURING PROCESS

THE COMPLETE PROCESS IN-HOUSE



ENGINEERING



MACHINING



ASSEMBLY



QUALITY CONTROL



PACKAGING

VALVE RECONDITIONING

EXTENSIVE SERVICE FOR ANY TYPE AND ANY BRAND

RECONDITIONING SERVICE

We offer reliable, cost-efficient solutions implemented by dedicated valve experts. International quality process step by step as follows:

- Thorough visual check
- Tracking of full service history
- Complete disassembly
- Accurate inspection of all parts (report of situation and condition analysis, root cause analysis)
- OEM engineering evaluation if required
- Cleaning (washing/glass bead blasting)
- Repair and re-machining or re-profiling
- Replacement of worn parts with new Burckhardt Compression quality parts
- Cleaning for oxygen service
- Assembly with correct tightening procedure
- Complete quality inspection including leakage test and confirmed by the golden label "Guarantee for Quality"
- Corrosion protection and optimal packing

YOUR BENEFIT

- Major costs savings by refurbishing and reconditioning your valve to like-new
- Guaranteed equal life-time of reconditioned valve in operation in alike condition
- Outstanding service partner offering the full service
- Replacement valves and components are Swiss engineered, featuring premium quality and reliability to ensure the lowest life cycle cost of your compressors
- Easy identification through valve label stamps
- Logging and assessment of valve operational history
- Identify possible optimization and implement actions to improve performance
- Leakage test certificate with the measured valves
- Warehousing and emergency stock keeping if required
- Fast service and support fulfillment
- Quick delivery of parts, valves and services



“After installing the Burckhardt Poppet Valves™ from Burckhardt Compression, our machines have run over 16'000 hours in oxygen service. We are fully satisfied with the results and our maintenance costs have been significantly reduced.”

Ewald Abgottspon, Technik LSI, Lonza, Visp, Switzerland



**COMPRESSOR KNOW-HOW
WITH IN-HOUSE
COMPETENCY COVERING
COMPRESSOR VALVE
TECHNOLOGY**



HIGHEST AVAILABILITY



SUPERIOR PERFORMANCE



LOWEST LIFE CYCLE COSTS

COMPRESSOR COMPONENTS

BEST PERFORMANCE
AND LONGEST LIFETIME

Compressor valves

Redura® rings & packings

Capacity control systems

Capital parts

Labyrinth piston compressor
components

Hyper/secondary compressor
components

SERVICES

THE FULL RANGE

Burckhardt Valve Service

Spare parts logistics

Field service

Technical support

Revamps & upgrades

Component repair

Condition monitoring &
diagnostics

Training

Burckhardt Compression AG

CH-8404 Winterthur

Switzerland

Tel.: +41 52 262 55 00

Fax: +41 52 262 00 51

24-hour emergency tel.: +41 52 262 53 53

aftersales@burckhardtcompression.com

www.burckhardtcompression.com

Your local contact

