COMPRESSOR SOLUTIONS FOR OFFSHORE APPLICATIONS
SIMPLICITY AND FLEXIBILITY FOR HEAVY DUTIES

Compressors for a Lifetime®
Burckhardt Compression is recognized as the global technology leader in the reciprocating compressor world. As an OEM with over 160 years of in-house experience in developing, engineering and manufacturing compressors, we are committed to highest reliability and best quality. Our compressor design combined with in-house developed key compressor components and a full range of services result in lowest life cycle costs.

BEST QUALITY –
FOR HIGHEST AVAILABILITY AND SAFETY

Manufacturing facility with state-of-the-art machining technology

Burckhardt Compression headquarters, Switzerland

Installation of a pre-fabricated compressor module
BOIL-OFF GAS COMPRESSORS USED IN OFFSHORE APPLICATIONS –
THE CUSTOMERS’ CHOICE SINCE DECADES

- Proven design for longest operation and highest safety requirements within challenging environments:
  Remote locations, rough seas, highly corrosive environment and difficult gases
- Customized compressor design with standardized modules and components for optimum performance
- Tradition meets innovation: conservative design for reliability
- Major customers in the offshore industry recognize Burckhardt Compression as a reliable partner
- Effective project management for shortest possible response time and fast project realization
- All out of one hand – from compressor design to the full range of services

MORE THAN 20 YEARS LIFETIME
More than 2,000 offshore compressor installations since 1962 with a rated power from 300 to 4,000 kW. Typically these compressors have a lifetime of more than 20 years and far over 50,000 operating hours.

APPROVAL BY ALL MAJOR CLASSIFICATION SOCIETIES:
OUR OFFSHORE CAPABILITIES
UNIQUE SOLUTIONS FOR YOUR CHALLENGES

GAS CARRIER

- Fuel gas handling
  - 4-stroke medium speed (DFDE)
  - 2-stroke slow speed (DFDM, ME-GI, low pressure DF)
- BOG handling
  - Rel Quefaction

LNG FPSO

- Fuel gas handling
- BOG handling
- Process gas handling
FSRU

- BOG handling
- Minimum send-out
- Process gas handling

MARINE CNG

- Fuel gas handling
- Cargo/charging compressor
- Gas pipeline

OTHER APPLICATIONS

- Seismic research
- Production platforms
- CO₂ re-injection
FUEL GAS COMPRESSORS
FOR 4-STROKE DUAL FUEL PROPULSION (DFDE) AND 2-STROKE LOW PRESSURE DUAL FUEL PROPULSION

A Class of Its Own When it Comes to Efficiency

FULL FLEXIBILITY – FOR OPTIMUM COST/PERFORMANCE RATIO

- Insensitive to varying suction and discharge conditions (pressure, flow, temperature, N₂ content)
- Compression of warm or cold gas
- Highly efficient capacity control from 0–100%

EASY OPERATION

- Low complexity, simple control system (no liquid injection)
- Maintainable by ship crew for lowest maintenance costs
- Pre-installed for fast installation and start-up – all auxiliaries integrated (lubrication, controls, purging, etc.)

FULLY BALANCED

- No free forces and moments
- Insensitive to ship movement and engine vibrations

HIGHEST RELIABILITY AND SAFETY

- Proven reliability and availability with hundreds of references
- Compressors widely applied in the offshore industry
- Gastight compressor design; no leakage to the environment, no loss of cargo

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BOG – 1 bara (15 psia)

LNG containment system

Fuel gas compressor

4-stroke dual fuel diesel engines

Fuel gas – 8 bara (116 psia)

2-stroke dual fuel diesel engines

Fuel gas – 20 bara (290 psia)
LABY®-GI COMPRESSOR SOLUTION

PERFORMANCE RANGE

- **Compressor Solutions for Offshore Applications**

  - **Laby®-GI, type LP190**
  - **Propulsion power**
    - 2'000 / 4'400 hp
    - 15 / 20'100 kW
  - **Boil-off gas – natural gas coming from containment system**
    - 12'000 / 26'500 kg/h / lbs/h
  - **LNG carrier capacity**
    - 130'000 m³
    - 150'000 m³
    - 170'000 m³
    - 200'000 m³
HIGH PRESSURE FUEL GAS COMPRESSORS
FOR 2-STROKE DUAL FUEL PROPULSION (DFDM, ME-GI)

Simplicity and Safety at Its Best

HIGHEST RELIABILITY AND SAFETY

- Many component references for boil-off gas applications
- High pressure safety concept officially approved
- Gastight compressor design; no leakage to the environment, no loss of cargo

FULLY BALANCED

- No free forces and moments
- Insensitive to ship movement and engine vibrations

HIGHEST ENERGY EFFICIENCY – FOR OPTIMUM COST/PERFORMANCE RATIO

- Highly efficient capacity control from 0–100% – even on part load

LOWEST LIFE CYCLE COSTS

- Simplicity for non-complex operation
- Simple control system – minimum training required
- Maintainable by ship crew
- Pre-installed for fast installation and start-up – all auxiliaries integrated (lubrication, controls, purging, etc.)
LABY®-GI COMPRESSOR SOLUTION

PERFORMANCE RANGE

Boil-off gas – natural gas coming from containment system

Laby®-Gi, type LP190
- 150'000 m³
- LNG carrier capacity

Laby®-Gi, type LP250
- 230'000 m³
- 260'000 m³

Laby®-Gi
- Propulsion power range: 2'000 / 4'400 to 8'000 / 17'600 (kg/h) / (lbs/h)
- 180'000 m³

Design assessment for type approval of Laby®-Gl
RELIQUEFACTION COMPRESSOR FOR LNG CARRIERS
INTEGRATED SOLUTIONS FOR MOST ECONOMIC OPERATION

Burn or Re-liquefy the Boil-off Gas

GAS FLEXIBILITY – FOR OPTIMIZED FUEL COSTS
- 100% reliquefaction when using HFO/MDO or for storage or anchorage
- Partial and full reliquefaction for excess boil-off gas
- Low energy consumption

OPERATIONAL FLEXIBILITY – FOR MAXIMUM DELIVERED CARGO
- In combination with DFDE, DFDM or DFDM/ME-GI propulsion systems as required
- Wide operating range (pressure, capacity, etc.)
- Compression of cold and warm gas
- More profitable freight contracts due to less cargo loss

HIGHEST RELIABILITY, EFFICIENCY AND SAFETY
- Cooperation with major system suppliers
- Highly efficient, even at part load condition of the reliquefaction unit
- Many references for boil-off gas applications

![Diagram of LNG containment system, reliquefaction system, compressor, side stream, and fuel gas flow.]
**LABY®-GI COMPRESSOR**

**PERFORMANCE RANGE**

<table>
<thead>
<tr>
<th>Pressure range</th>
<th>Laby®-GI, type LP190</th>
<th>Laby®-GI, type LP250</th>
</tr>
</thead>
<tbody>
<tr>
<td>350 / 5'080 bar / psia</td>
<td></td>
<td></td>
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<tr>
<td>20 / 290</td>
<td></td>
<td></td>
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<tr>
<td>10 / 145</td>
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</tbody>
</table>

**LNG carrier capacity**

130'000 m³ to 260'000 m³
LNG FPSO, FSRU AND PRODUCTION PLATFORMS

COMPRESSOR SYSTEMS FOR A WIDE RANGE OF DUTIES

WIDE RANGE OF DUTIES

- Boil-off gas handling
- Fuel gas for power generation
- Pipeline supply, minimum send-out
- Gas lift
- CO₂ re-injection

FLEXIBILITY – FOR OPTIMUM PERFORMANCE

- Large operating range (pressure, capacity, lubricated, non-lubricated, etc.)
- Compression of cold and warm gas

MODULAR CONCEPT – FOR FAST INSTALLATION

- For original equipment and also for retrofit
- Pre-installed for fast installation and start-up – all auxiliaries integrated (lubrication, controls, purging, etc.)

HIGHEST RELIABILITY, EFFICIENCY AND SAFETY

- Highly efficient, even at part load condition
- Many references for boil-off gas applications
COMPRESSOR SOLUTIONS FOR LNG FPSO, FSRU AND PRODUCTION PLATFORMS

Laby® Compressor

Laby®-GI Compressor

Process Gas Compressor

PERFORMANCE RANGE

Discharge pressure

100 / 60
1'000 / 14'500
350 / 5'080
300 / 4'350
1 / 15

Capacity

1'000 / 14'500
350 / 5'080
300 / 4'350
1 / 15

Process Gas Compressor

Laby®-GI Compressor

Laby® Compressor

(Nm³/h) / scfm
Laby® GI Compressor package installed between the first two spherical LNG tanks on a FSRU.
BURCKHARDT COMPRESSION
THOROUGH IN-HOUSE EXPERTISE ENSURING COMPREHENSIVE SUPPORT...
...FOR SHIPYARDS, SHIP OWNERS, SHIP OPERATORS AND ENGINEERING PARTNERS

COMPRESSOR DESIGN
- Ship roll studies
- Instationary fluid dynamics
- Pre-sales support incl. detailed documentation
- Engineering study
- Feasibility study
- Selection and sizing
- Pulsation and vibration studies
- 3D CAD
- Compressor valves
- Rings and packings

RESEARCH & DEVELOPMENT
- Tribology incl. test beds
- Finite element analysis
- Mechatronics

SERVICES
- Remote locations
- Engineering services
- Spare parts logistics
- Revamps
- Field service
- Valve service
- Component repair
- Technical support
- Monitoring and diagnostics
- Training

MANUFACTURING
- Corrosion protection
- CAM in-house machining
- Purchasing
- Assembly
- Test beds
- Quality assurance

PLANT ENGINEERING
- Contracting
- Customer and standard specifications
- Compressor and auxiliaries on modules
- Cooling water system
- Instrument and control, motors
- PLC programming
- Turn-key projects
- Skid mounted
# SERVICES

WHEREEVER, WHENEVER YOU NEED IT

| BURCKHARDT VALVE SERVICE |  |
|--------------------------|--|---|
| **FAST VALVE SERVICE WITH EXTSIVE GUARANTEE** | Analysis of valve condition | Complete quality inspection |
|  | Tracking of valve history | State-of-the-art leak test |
|  | OEM valve engineering | Root cause analysis |
|  | Valve cleaning and overhauls | Corrosion protection |

| SPARE PARTS LOGISTICS |  |
|-----------------------|--|---|
| **OEM GUARANTEE AND BEST LIFE CYCLE COSTS** | Original spare parts with OEM guarantee | 12 month guarantee |
|  | Spare parts frame agreements | Save time and money: use the Burckhardt e-Shop™ – the easy spare parts identification and ordering system |
|  | Stock recommendations |  |
|  | Express service for emergencies |  |
|  | Over 16,000 parts on stock |  |

| FIELD SERVICE |  |
|---------------|--|---|
| **BENEFIT FROM OUR SKILLED RECIP EXPERTS AND OUR OFF-SHORE EXPERIENCE** | On-site assembly and installation | Start-up support |
|  | Erection/commissioning | Service contracts/preventive maintenance |
|  | High safety standards – SCC and HUET certified | Plant overhaul/revision |
|  | Turn-key installations | 12 month guarantee |

| TECHNICAL SUPPORT |  |
|-------------------|--|---|
| **PROFESSIONAL SUPPORT FROM OUR WELL TRAINED AND EXPERIENCED SPECIALISTS** | Performance analysis for optimized and efficient compressor operation | Emergency availability 24/7 |
|  | Start-up support | On-site failure analysis |
|  | Troubleshooting | Online diagnostic support |
|  | Root cause analysis | Consulting |

| COMPONENT REPAIR |  |
|------------------|--|---|
| **SAVE MONEY AND GET “AS NEW” GUARANTEE** | Condition analysis | Incorporation of the latest technology where possible |
|  | Recommendations concerning which parts can be repaired or need to be replaced | 12 month guarantee |
|  |  | Repair of crossheads, piston rods, cylinder liners, bearings, pistons |

| ENGINEERING SERVICES |  |
|----------------------|--|---|
| **SOPHISTICATED IN-HOUSE SIZING AND ANALYSIS TOOLS** | State-of-the-art pulsation and vibration analysis | Reverse engineering and reengineering for own as well as for other brand compressor systems |
|  | Finite element analysis | Dynamic analysis for any compressor parts |
|  | Unique analysis models for high pressure application |  |
## REVAMPS
**REJUVENATE OR TUNE YOUR COMPRESSOR**
- Modernizing
- Upgrades/retrofits
- Relocation of machines
- Debottlenecking
- Operation mode studies
- Support for system evaluation
- Comprehensive customized service from diagnostic service to predictive maintenance
- Full service agreements for maximum availability
- Online diagnostic services
- Broad experience through compressor installations in various processes
- Conversion from lubricated to non-lubricated operation
- Turn-key installations

## MONITORING AND DIAGNOSTICS
**EXTEND MEANTIME BETWEEN OVERHAUL**
- Support for system evaluation
- Comprehensive customized service from diagnostic service to predictive maintenance
- Full service agreements for maximum availability
- Online diagnostic services

## COMPRESSOR TECHNOLOGY TRAINING
**HAVE YOUR OWN COMPRESSOR SPECIALISTS**
- Theoretical and practical training from our compressor experts
- Training center with full size equipment (Laby®, Process Gas and Hyper Compressor)
- Broad experience through compressor installations in various processes
- Standard trainings, customer specific programs on request

## SERVICE CENTERS WORLDWIDE
- Service Center and field engineer base
- Burckhardt Compression Authorized Service Center

**24 hours emergency:**
+41 (0)52 262 53 53
RECIROCATING COMPRESSORS
LEADING TECHNOLOGY FOR
LOWEST LIFE CYCLE COSTS

Laby® Compressors
Contactless and oil-free

Laby®-6I Compressors
Fully balanced

Process Gas Compressors
API 618 – lowest life cycle costs

Hyper Compressors
Safe and reliable up to 3'500 bara / 51'000 psia

Standard High Pressure Compressors
Dependable for critical gases

COMPRESSOR COMPONENTS
BEST PERFORMANCE
AND LONGEST LIFETIME

Valves
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

FOR ALL YOUR RECIROCATING COMPRESSORS

Burckhardt Compression AG
CH-8404 Winterthur
Switzerland
Tel.: +41 (0)52 262 55 00
Fax: +41 (0)52 262 00 51
24 hours emergency Tel.: +41 (0)52 262 53 53
info@burckhardtcompression.com
www.burckhardtcompression.com

Compressors for a Lifetime®