Multiphase
Pumps & Systems

Bornemann Pumps

Bornemann
Pumps & Systems
Worldwide
Network

Go With The Leaders

■ Over 10 Years Field Experience In Multiphase Applications

Headquarter of Joh. Heinr. Bornemann GmbH in Northern Germany.

When the concept of multiphase pumping was first introduced to the market, the specification, packaging, and procurement of this unique technology was initially handled in similar fashion to that of conventional liquid handling pumps.

The heart of the package which is comprised of the multiphase pump, motor, and baseplate were sourced from the manufacturer, valving, piping, and instrumentation was typically sourced by another supplier, while variable speed controls and a PLC may have been sourced by yet another supplier.

Occasionally, this multiple source approach towards packaging led to operation problems due to the fact that one or more of the suppliers were not familiar with the peculiarities of multiphase pumping.

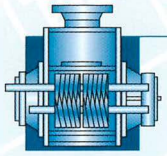
In 1994, Bornemann recognized the need for clients to have a single source supplier responsible for both the hardware as well as the operating process of the equipment in their particular field. Subsequently, Bornemann Multiphase Systems were developed to provide a flange-to-flange solution. Since then, *over thirty (30) Multiphase Systems* have been placed in operation worldwide.

Bornemann Pumps

Multiphase Pumps & Systems

■ Our Commitment To Technological Excellence

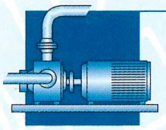
Contents



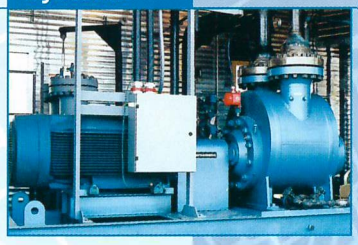
Pumps

Simplicity Of Design,
Reliability And User-Friendliness

- Superior Pump Technology
- Economic Advantages



Systems



Flange-To-Flange Solutions
Tailor-made To Your Specific Application

- Onshore Field Installations
- Offshore Field Installations

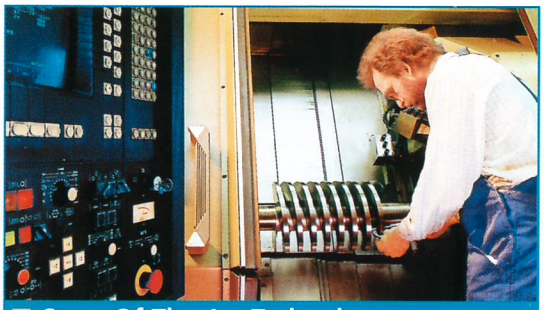
Services

Complete Program
For Our Customers

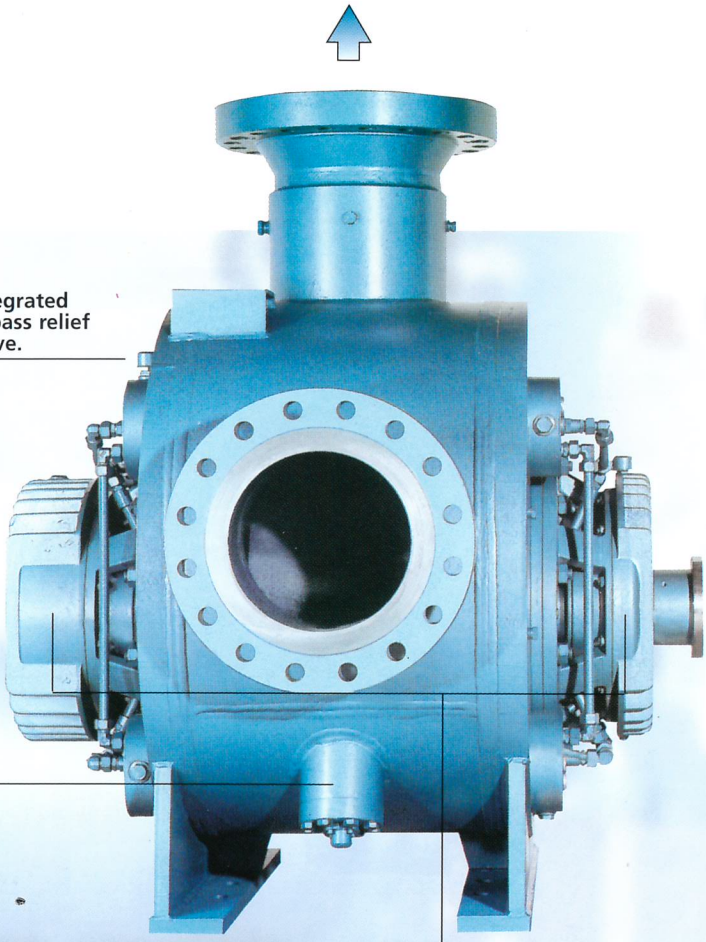
→→→ Please take a look at the jacket flap of this brochure for information concerning data.

Bornemann Pumps

Multiphase Pumps
MW Series Technology



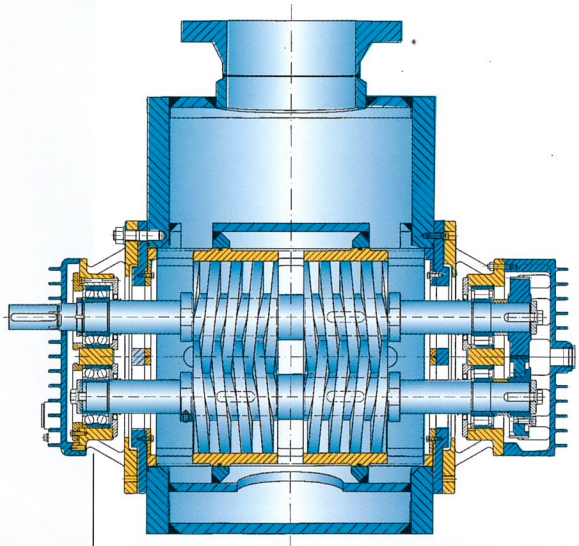
State Of The Art Technology



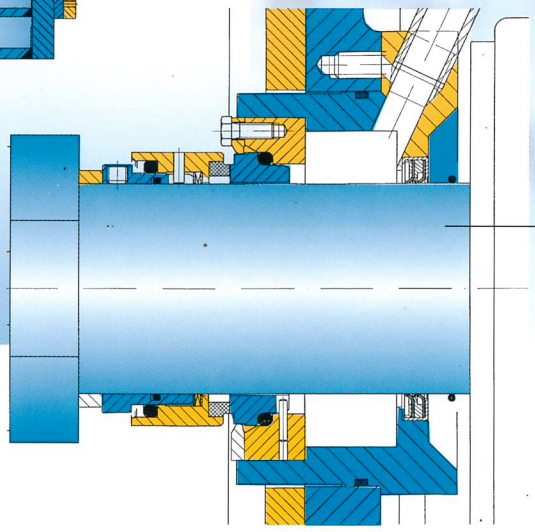
Integrated bypass relief valve.

Patented integral circulation system.

Oil-lubricated external bearings and timing gears ensure maximum service life and minimum maintenance requirements even in heavy duty applications.



Single-acting mechanical seals with non-pressurized buffer system.



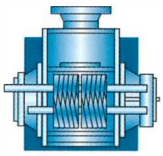
Single-acting mechanical seals with non-pressurized buffer system, with wear-resistant silicon carbide/carbon seal faces.

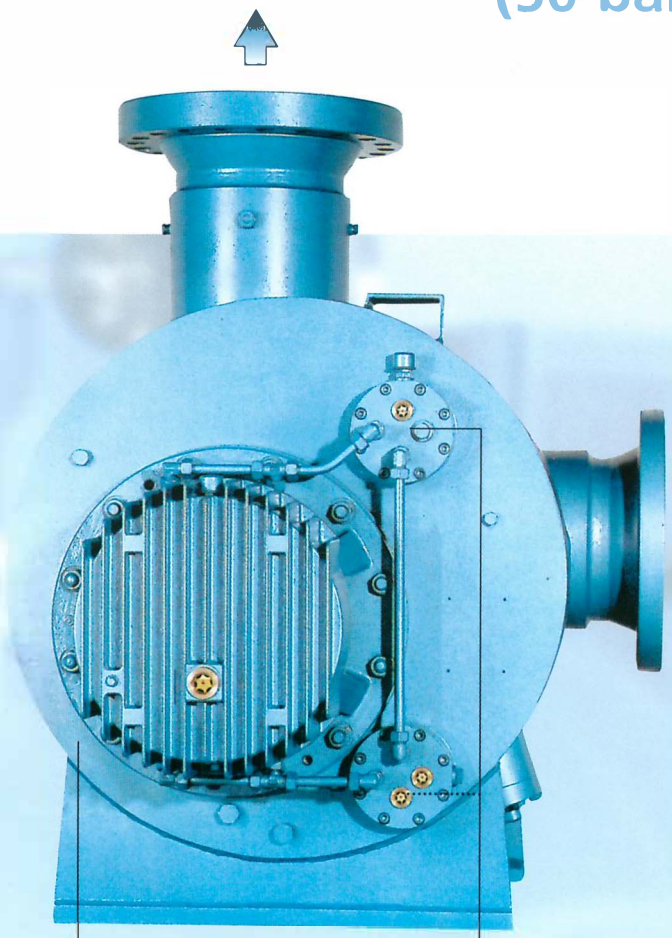
MW-Series Advantages

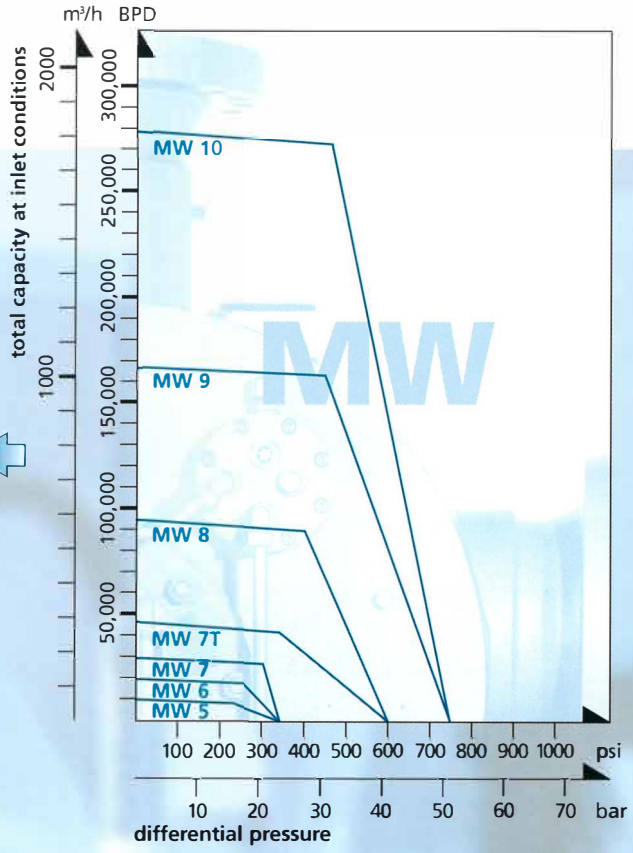
- **Design** for inlet pressures up to 290 psi (20 bar) and differential pressures up to 700 psi (50 bar).
- **Capacity** up to 280,000 BPD (1,800 m^3/h).
- **Patented** integral circulation system.
- **No need** of external cooling or lubricating systems.

Diff. press. up to 700 psi (50 bar)

Bornemann
Multiphase Pumps
MW Series Technology – Specific To Your Needs





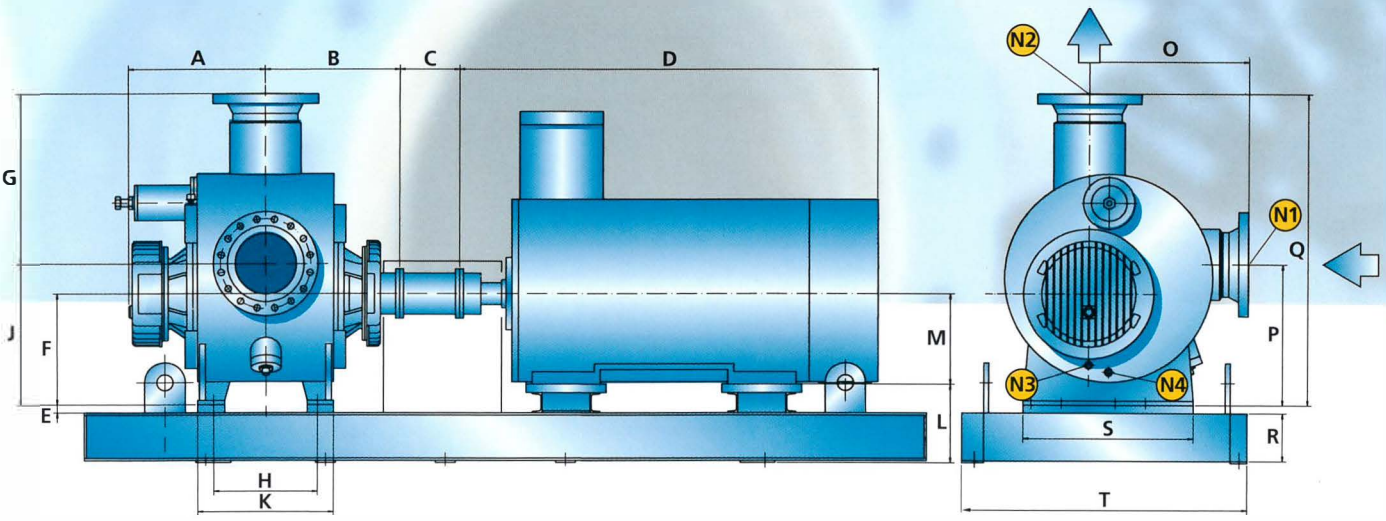


Fully welded pump casing with large separation chamber provides outstanding dry-running capability.

Non-pressurized buffer system.

■ **Selection Of Pump Type**

Of the many variables which must be considered in selecting a multiphase pump for a given application, inlet pressure is the decisive factor for the most economical model.



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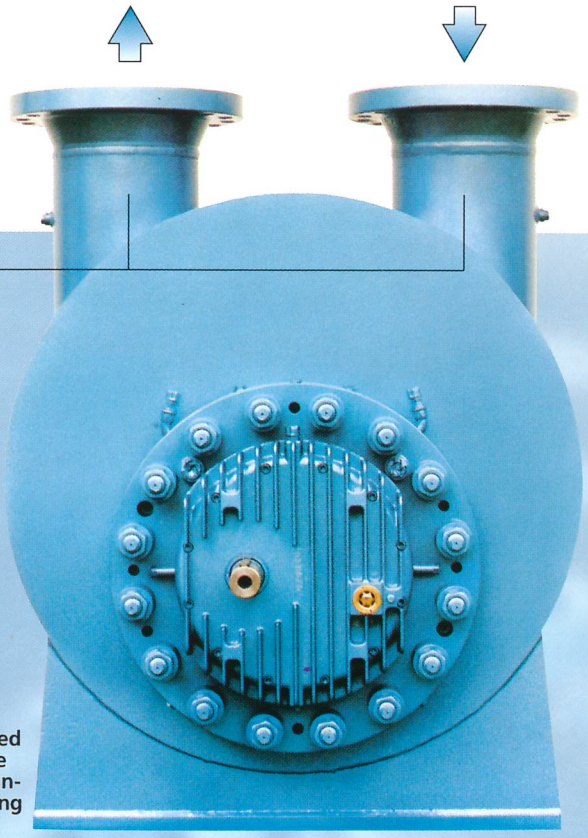
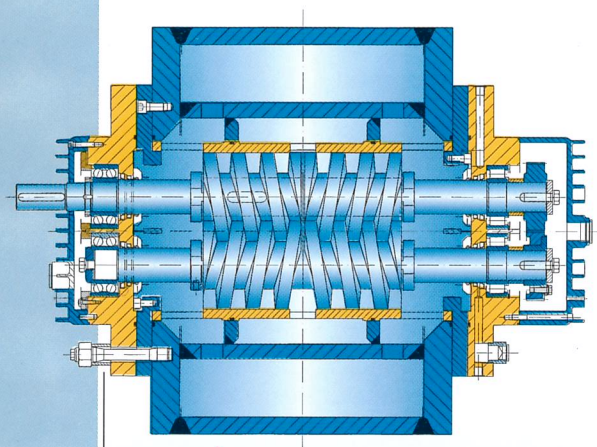
Bornemann Pumps

Multiphase Pumps
MPC Series Technology

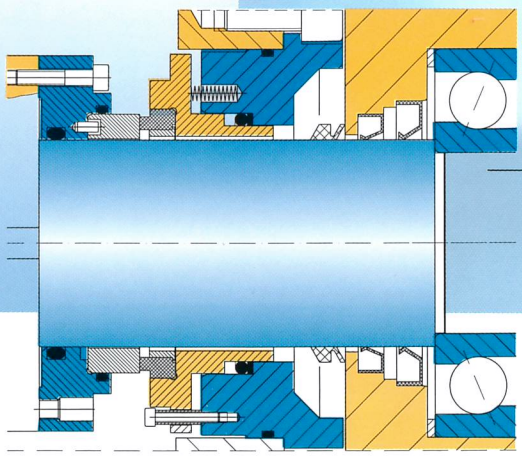
Special Trained Personnel



Inlet and discharge flanges located on upper side provide enhanced dry running capability.



Single-acting mechanical seals with non-pressurized buffer system.



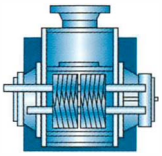
Special pump design allows use of simplified single-acting mechanical seals, i. e. no need for seal buffer system. With wear-resistant silicon carbide/carbon sealfaces. The patented integrated separation system provides permanent flooding of mechanical seals.

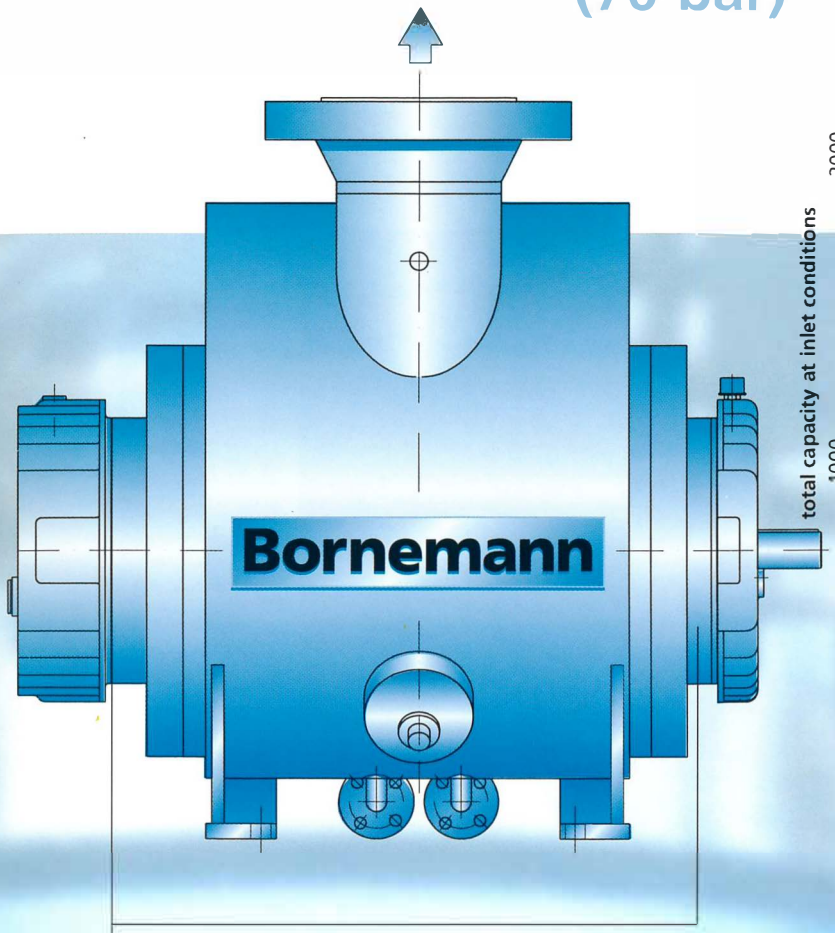
MPC-Series Advantages

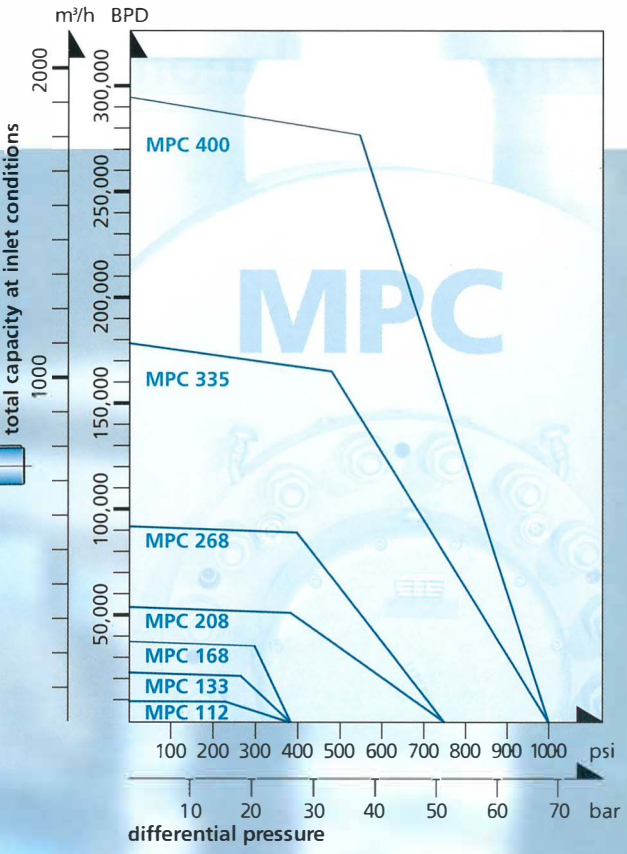
- **Design** for inlet pressures up to 1,000 psi (70 bar) and differential pressures up to 1,000 psi (70 bar).
- **Capacity** up to 300,000 BPD (2,000 m^3/h).
- **100 %** dry running capability.
- **Oil-lubricated** external bearings.
- **Patented** integral circulation system.

Diff. press. up to 1,000 psi (70 bar)

Bornemann
Multiphase Pumps
MPC Series Technology – Specific To Your Needs

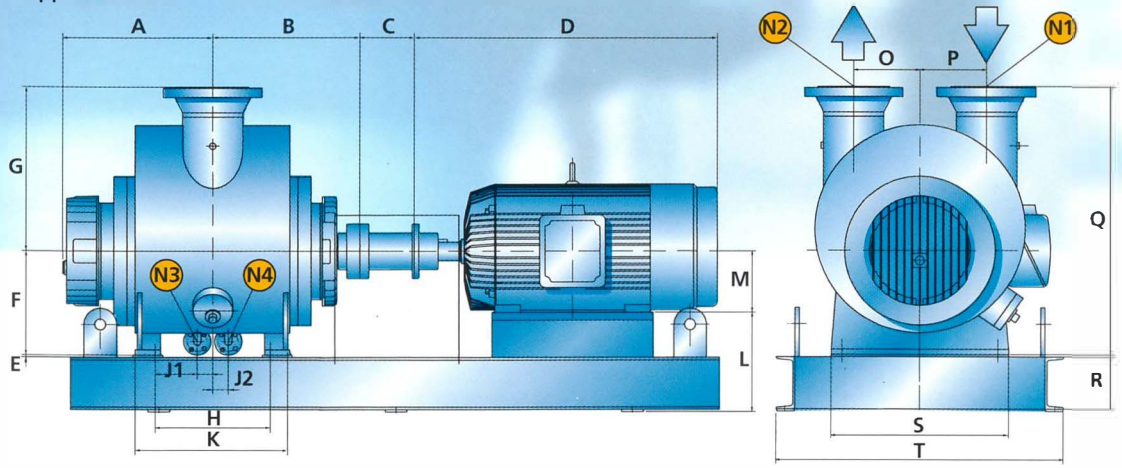






Oil-lubricated external bearings and timing gears ensure maximum service life and minimum maintenance requirements even in heavy duty applications.

■ **Bornemann Expert Assistance**
Our Applications Engineering Department and Technical Sales Consultants will provide you professional support in selecting the Bornemann multiphase pump which best fits your needs.



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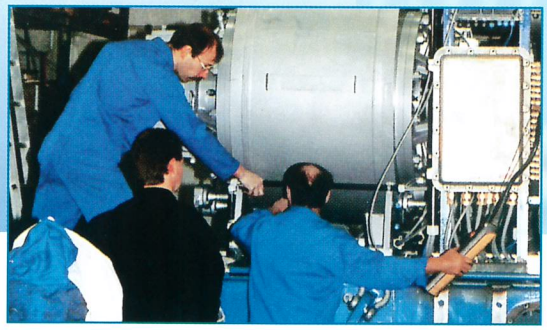
Bornemann Pumps

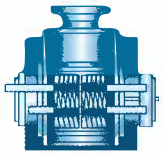
Multiphase
Pump Installation Examples

Bornemann Multiphase Pumps – Where Are They Used?

- **Declining Fields**
  To upgrade low pressure streams to nominal system pressure.
- **Marginal Fields**
  To allow profitable exploitation of small fields by connecting them to larger fields.
- **Offshore Fields**
  To transport production from satellite platforms to the host platform and onward to onshore facilities. Separator stations or other flow conditioning systems are not required, providing significant space and weight savings.
- **Pipeline Transfer**
  To convey production from large fields to central processing facilities without need for separation.
- **Winter Service In Cold Areas**
  To reduce wellhead pressure, thereby avoiding clogging of flow lines due to hydrate formation.

Bornemann – well known for quick and perfect support even on-site.





Offshore installation in the Gulf of Mexico for production boosting of declining wells.

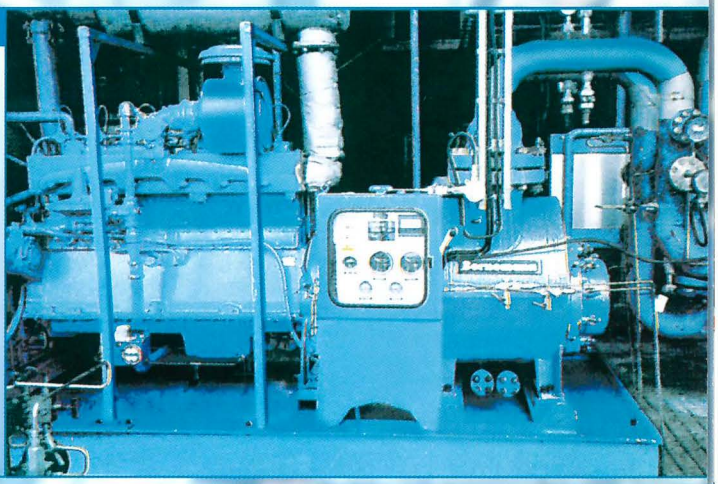
MPC 208-38

- **Fluid Stream:** 1,207 BFPD (8 m³/h)
- **Gas Stream:** 370 MSCFD (436 sm³/h)
- **Gas Content:** 95 %
- **Inlet Pressure:** 30 psi (2 bar)
- **Discharge Pressure:** 682 psi (47 bar)
- **Pump Capacity:** 23,400 BPD (155 m³/h)
- **Shaft Power:** 322 HP (240 kW)

Offshore installation in the Caribbean sea: provides increased production by reducing well head pressure.

MPC 208-67

- **Fluid Stream:** 4,650 BFPD (31 m³/h)
- **Gas Stream:** 4,600 MSCFD (5,433 sm³/h)
- **Gas Content:** 78 %
- **Inlet Pressure:** 710 psi (49 bar)
- **Discharge Pressure:** 1,000 psi (69 bar)
- **Pump Capacity:** 21,100 BPD (140 m³/h)
- **Shaft Power:** 158 HP (118 kW)



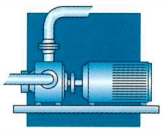

Bornemann Multiphase
System Solutions In Perfection
NR.3
Bornemann

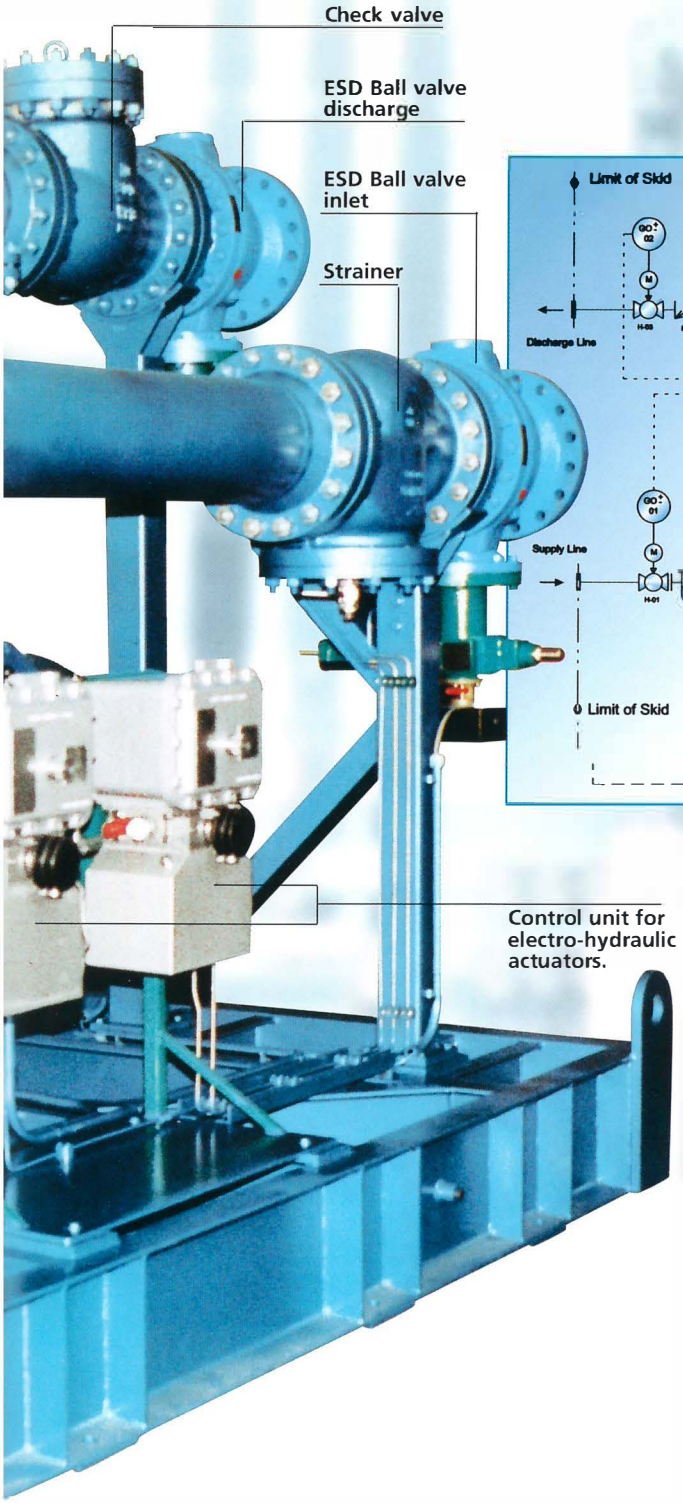
Bornemann Pumps

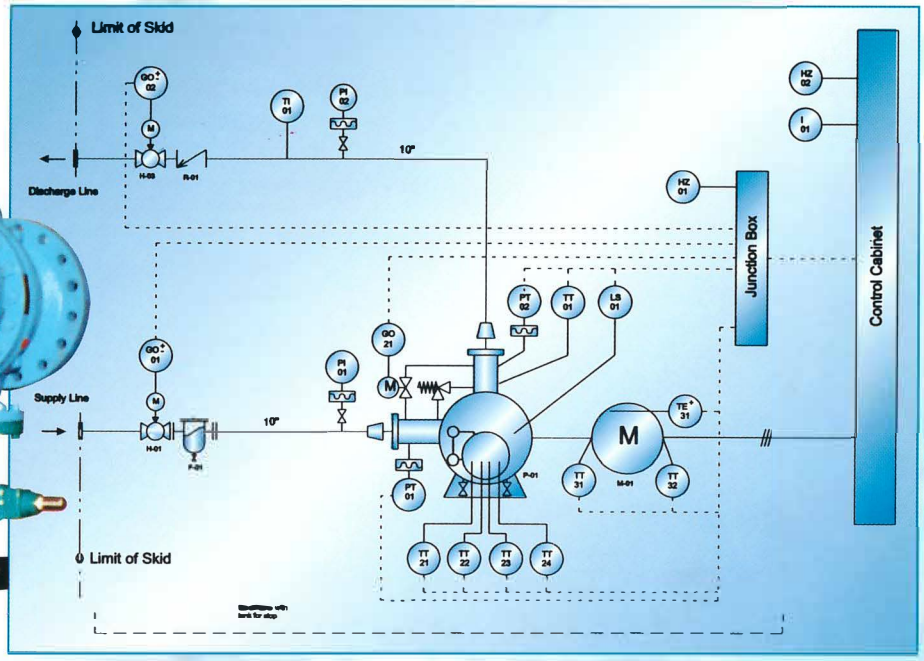
Multiphase –
Introduction Of The Standard System Technology

Experience Is The Key

- As shown by decades of experience, correct selection of components is the key to successful operation of a pump system as a whole.
- Bornemann has the know-how and expertise required for the design of flange-to-flange solutions tailor-made for your specific application.
- Planning, design, manufacturing, installation and service – Bornemann provides it all – along with single-source responsibility.





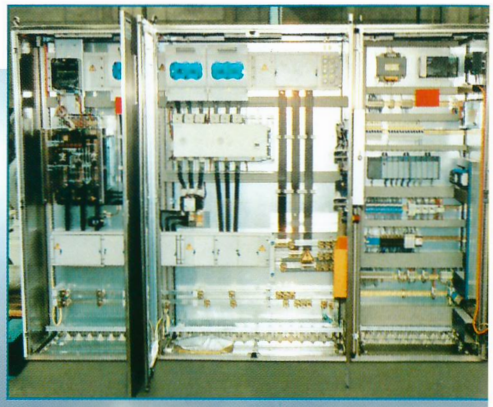


Economic Advantages

- Increased production output by up to several 100 %.
- Rapid return of investment, often within a few weeks.
- Reduced capital investment, as field separator stations are not required.

Bornemann Pumps

Multiphase
System Configuration



System

Bornemann Multiphase Systems typically incorporate the following:

- One pump skid with inlet & discharge piping
- Piping auxiliaries such as check valves, gate valves, safety valves, and strainers
- Variable frequency control inverter drive
- Instrumentation, controls, and monitoring system

Completely automated Multiphase Systems are now available from Bornemann; subsequently, the equipment is extremely simple to run and requires little if any action by the operators.

Layout

The basic layout of a Bornemann Multiphase System is comprised as follows:

Skid:

- Multiphase Pump
- Electric motor or gas/diesel engine
- Coupling
- Baseplate
- Inlet & discharge piping to edge of skid

Control & Monitoring System:

- PLC controlled actions of the system sequences safety shutdown relay chain independent of the PLC
- One button start/stop
- Optional vibration monitoring of pump bearings
- Optional fire and gas detection/Alarm system

Inlet Side:

- Inlet ESD valve (fail safe close)
- Simplex or duplex strainer

Discharge Side:

- Check valve (common or nozzle type)
- Discharge ESD valve (fail safe close)
- Safety relief valve
- Depressurizing valve

Other Available Features:

- Bypass line between inlet and discharge line for natural flow
- Automatic or manually controlled sump pump to evacuate drain tank integrated into the baseplate
- Remote control operation via modem to a master control room

Instrumentation:

Various gauges, switches and transmitters can be incorporated to monitor system parameters such as pressure, temperature, and vibration depending on the clients' needs.

Testing

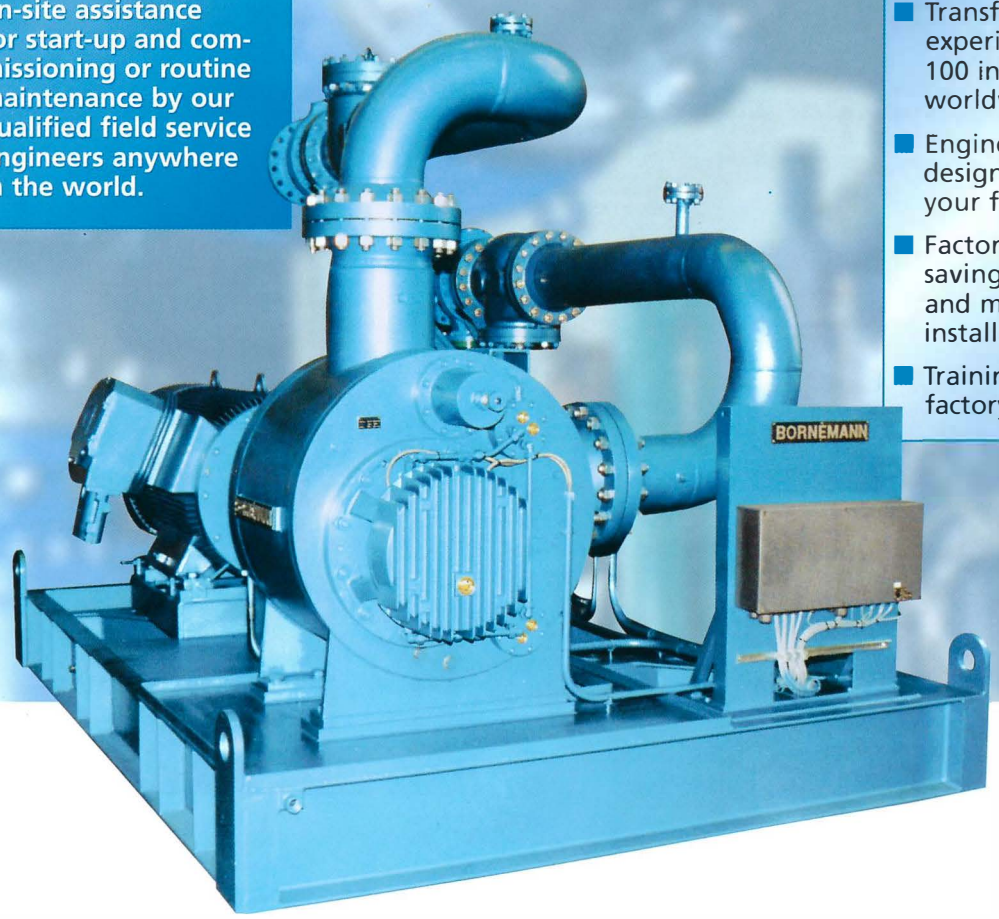
- All Bornemann Multiphase Systems are tested at the factory to assure that all components interface properly and function according to the design. Additionally, Bornemann can provide factory training to the clients' personnel as well as on-site assistance for start-up and commissioning or routine maintenance by our qualified field service engineers anywhere in the world.

Safety

- The primary design philosophy behind each and every Bornemann Multiphase System is safety for both the overall system and the environment.

Conclusions

- In summary, the advantages Bornemann Multiphase Systems provide are:
  - Safe & reliable system philosophy
  - Single source supply & responsibility
  - Transfer of field experience with over 100 installations worldwide
  - Engineered system designed specifically for your field conditions
  - Factory tested system saving both time and money at the installation
  - Training by experienced factory personnel



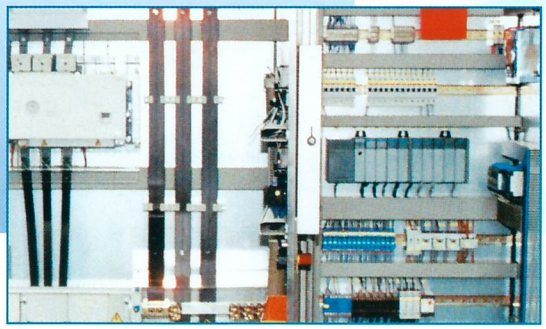
Bornemann Pumps

Multiphase
System Installation Examples

Bornemann Multiphase Pumps – Selection Of Our Customers Worldwide

- Amoco Texas, USA
- Caltex Pacific, Indonesia
- Corpoven San Tomé, Venezuela
- Lagoven, Morichal, Venezuela
- LUKoil Kogalym, Russia
- LUKoil Langepas, Russia
- Mobil Lastrup, Germany
- Mobil Oil Gas Plant, Canada
- Perez Companc, Venezuela
- Petro Canada, National Oilwell, Canada
- Preussag Energie, Germany
- Shell House Mountain, Canada
- Tatoil, Tartastan, Russia

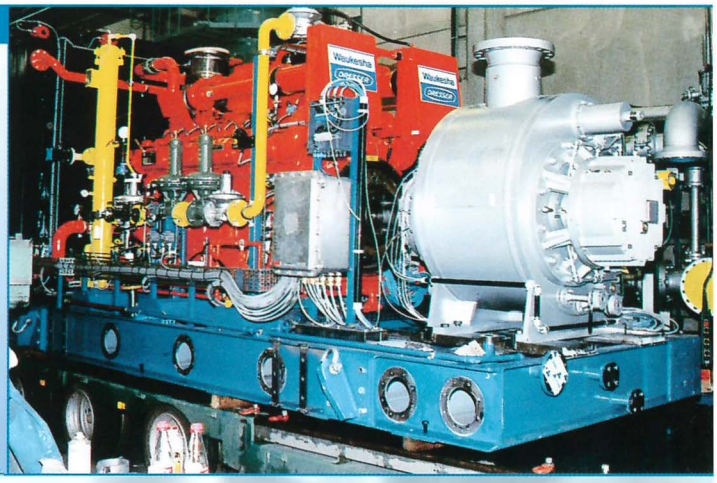
Electrification, hard- and software – our single-source competence in all fields guarantees you perfect support.



Onshore installation on an existing flow station.

MW 9.5zk-53

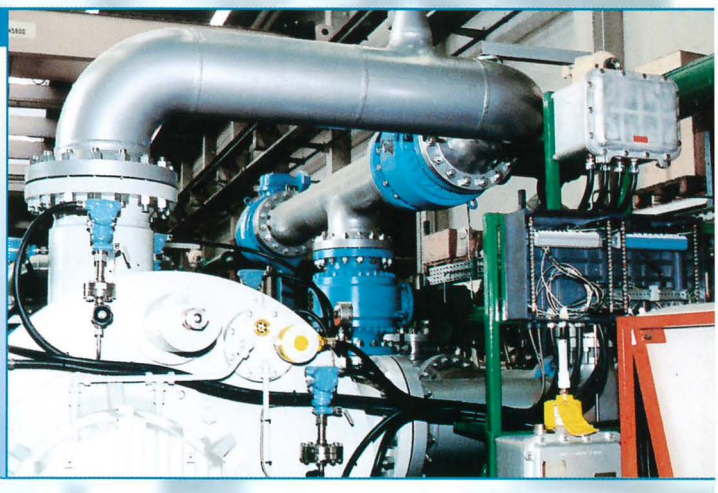
- **Fluid Stream:** 2,726 BFPD (18 m³/h)
- **Gas Stream:** 1,514 MSCFD (1,787 sm³/h)
- **Gas Content:** 97 %
- **Inlet Pressure:** 305 psi (2,1 barg)
- **Discharge Pressure:** 580 psi (40 barg)
- **Pump Capacity:** 91,000 BPD (602 m³/h)
- **Shaft Power:** 977 HP (729 kW)



Worldwide first field development using multiphase technology.

MW 9.5zk-90

- **Fluid Stream:** 11,798 BFPD (78 m³/h)
- **Gas Stream:** 1,278 MSCFD (1,500 sm³/h)
- **Gas Content:** 92 %
- **Inlet Pressure:** 10,1 psi (0,7 barg)
- **Discharge Pressure:** 261 psi (18 barg)
- **Pump Capacity:** 147,000 BPD (977 m³/h)
- **Shaft Power:** 1,114 HP (831 kW)



Bornemann Pumps

Worldwide Services – Complete Program For Our Customers

Maintenance

- Pump check
- Overhaul
- Performance test
- Inspection

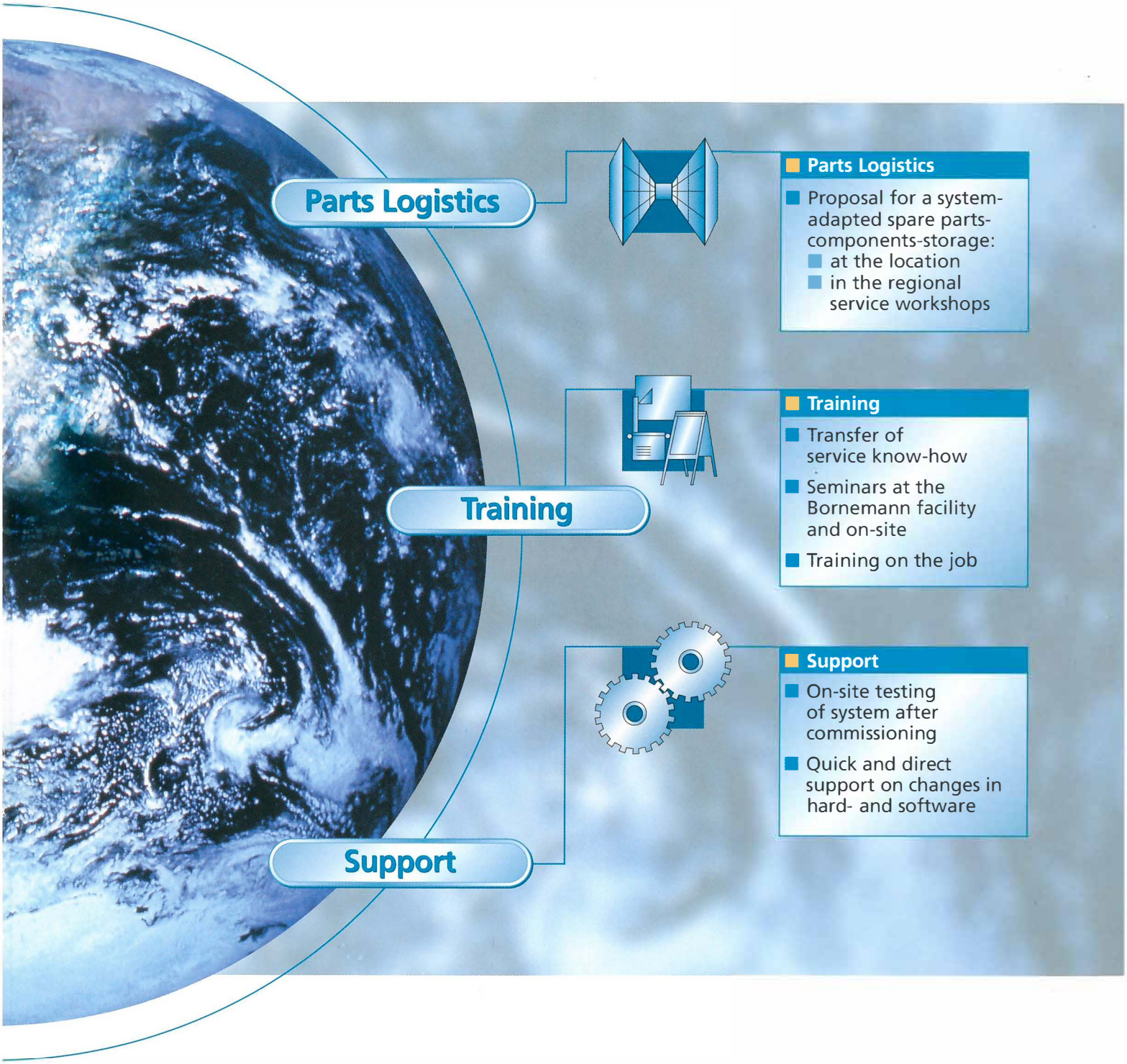
Service Hotline

- Specialists' support on:
  - Application and operation
  - Localisation of faults
  - Elimination of faults

On-Site Service

- Pump system check
- Trouble shooting
- Maintenance/Repairs
- Supervision of customer personnel

Bornemann
Multiphase Pumps
Worldwide Services –
We Are Prepared



Parts Logistics

- Proposal for a system-adapted spare parts-components-storage:
  - at the location
  - in the regional service workshops

Training

- Transfer of service know-how
- Seminars at the Bornemann facility and on-site
- Training on the job

Support

- On-site testing of system after commissioning
- Quick and direct support on changes in hard- and software

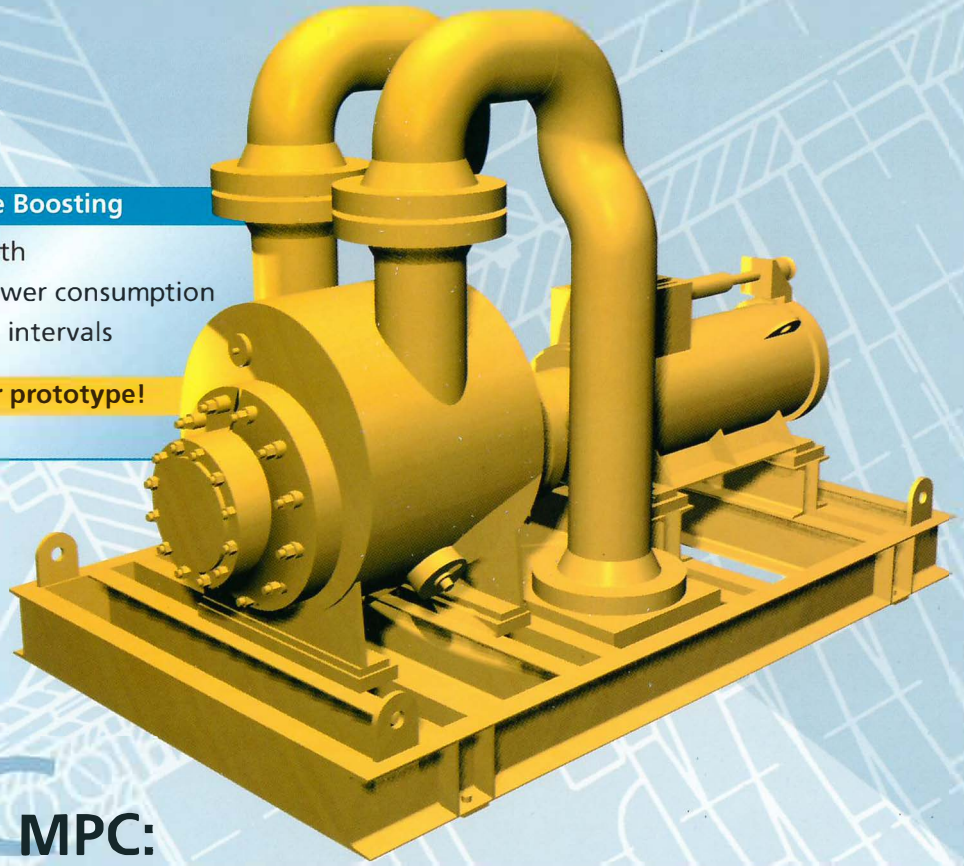
Bornemann Pumps

Multiphase Pump
Innovations

Our Experience Is The Key To
Your Success In The Future

Visions
Become Reality

With Subsea Multiphase Boosting
Into The Next Millennium



- **Subsea Multiphase Boosting**
- 2,000 m water depth
- Up to 2,500 kW power consumption
- At 24,000 h service intervals
- **Come and visit our prototype!**

New Type MPC:
Bigger – Better – Bornemann

We Match With The Customers Requirements

- **MPC 500**
- Max. capacity:
  600,000 bpd (4,000 m^3/h)
- Max. absorbed power:
  6,800 HP (5,000 kW)
- Differential pressure
  up to 1,450 psi (100 bar)

Bornemann Pumps

Pumps And Systems For Industry,
Environmental Technologies And Shipbuilding

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Polkehn Kommunikation Design • Hameln