

# BORNEMANN MULTIPHASE BOOSTING

A CHANGE OF PERSPECTIVE



# WHY DO COMPANIES BUY BORNEMANN MULTIPHASE PUMPS?

INTELLIGENT UPSTREAM SYSTEMS  
FOR THE OIL AND GAS INDUSTRY

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## INCREASED OIL RECOVERY WITH MULTIPHASE TECHNOLOGY

### UNPREDICTABLE FLOW

The focus is on unpredictable flows, previously considered as unprofitable. Multiphase pumps handle these with ease and at a fraction of the conventional costs.

### UNTREATED STREAM

There is a Multiphase solution to suit a whole range of potential flows. Untreated products ranging from wet gas to heavy crude are pumped reliably in any situation – off-shore, subsea, thermal, conventional. In addition flaring can be avoided making this by-product available for profitable use.

### INACCESSIBLE ENVIRONMENTS

Exploiting oilfields in harsh environments and subsea. Extending the life of dying oilfields in this way is the perfect opportunity to generate a sizeable profit.

The comparatively small investment and impressively low maintenance and running costs are the benefits.

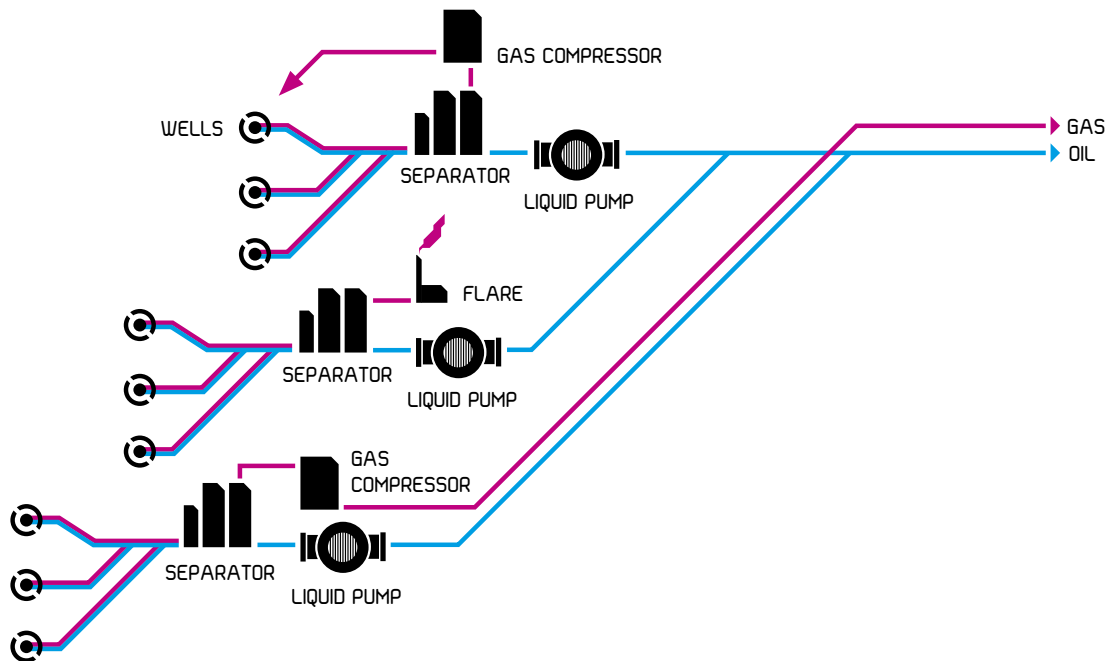


Unique solutions made in multiphase systems

# LESS SEPARATION

MULTIPHASE MAKES WELLHEAD SEPARATORS OBSOLETE AND THE PROFIT IS IN YOUR HAND!

## CONVENTIONAL STREAM



# LESS COSTS

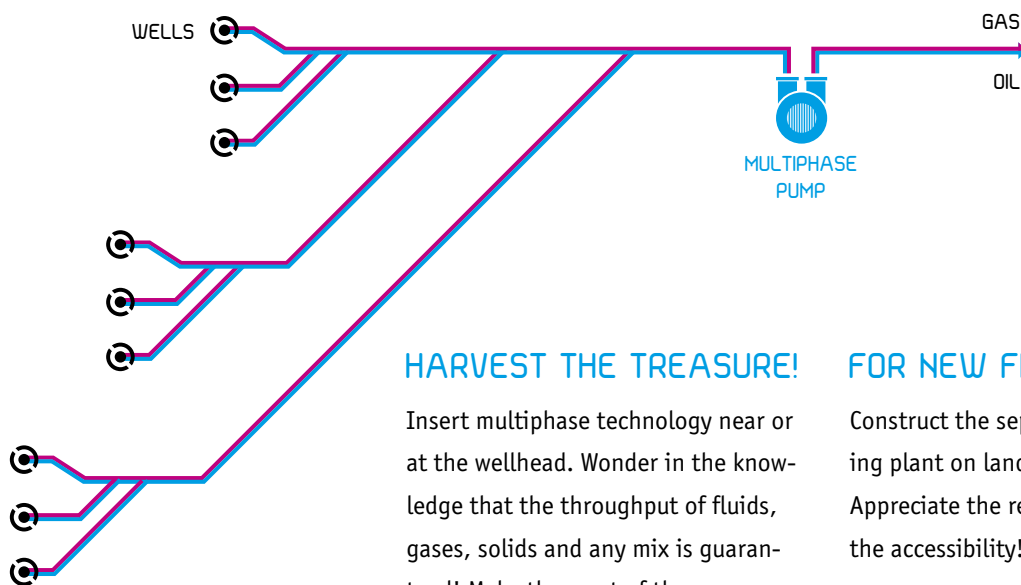
## CAPITAL INVESTMENT AND OPERATIONAL EXPENDITURE DOWN

Multiphase offers cost savings almost everywhere. The only equipment necessary is delivered as a complete fully-functional unit mounted on a skid. Consequently engineering and installation are straightforward and the construction period is shortened.

Coming on stream could not be easier. Just connect the well, Multiphase Unit, Pipeline and Power. The proven mechanical seal and system design guarantee that Multiphase will satisfy the most stringent environmental requirements and work under full safety

without extra investment. The Multiphase compact design also requires much smaller land-based installations, resulting in a further saving.

## UNTREATED STREAM USING BORNEMANN MULTIPHASE TECHNOLOGY



### HARVEST THE TREASURE!

Insert multiphase technology near or at the wellhead. Wonder in the knowledge that the throughput of fluids, gases, solids and any mix is guaranteed! Make the most of the conveniently situated existing plant.

### FOR NEW FIELDS

Construct the separators and processing plant on land where it best suites. Appreciate the refinement and open up the accessibility!

## RUNNING COSTS COULD NOT BE LOWER

A reduced maintenance program combined with a minimal on-site replacement part store results in further savings. The near maintenance-free installation ensures a reduced manpower requirement and coupled

with the high reliability leads to virtually no outage. Keep the oil flowing and maximize your margins!

# MINIMAL IMPACT

POLLUTION DOWN NEAR ZERO.  
LAND REQUIREMENTS REDUCED.  
ENERGY SAVING.



Bornemanns contribution to the environment ...



... to give the nature a chance.

## MULTIPHASE BOOSTING IS CLEAN

Due to the unique Multiphase pump design there are no leakages of gas or liquid. The energy saved through the use of the previously flared gases is also a contribution to keeping our environment clean.

Separation at source requires costly multi-transport of the separated products. The Multiphase principle of transport before separation protects the environment by consuming considerably less energy and using less land. The gases previously flared off are now available e.g. for power generation, sales, gas injection.

Land-based projects: The same straightforward installation and cost savings apply. Whatever the situation – permafrost, desert, jungle – Multiphase is the solution.

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# THE BORNEMANN MULTIPHASE DESIGN

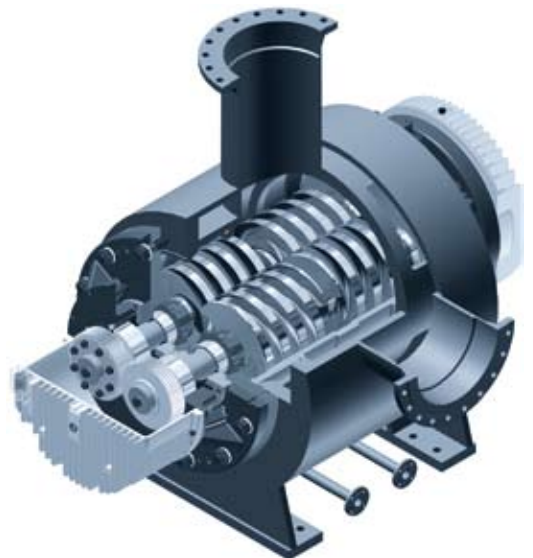
YOU WILL GET THE BEST SOLUTION FOR YOUR  
APPLICATION WITH OUR TAILOR-MADE PUMPING  
SCREW DESIGN

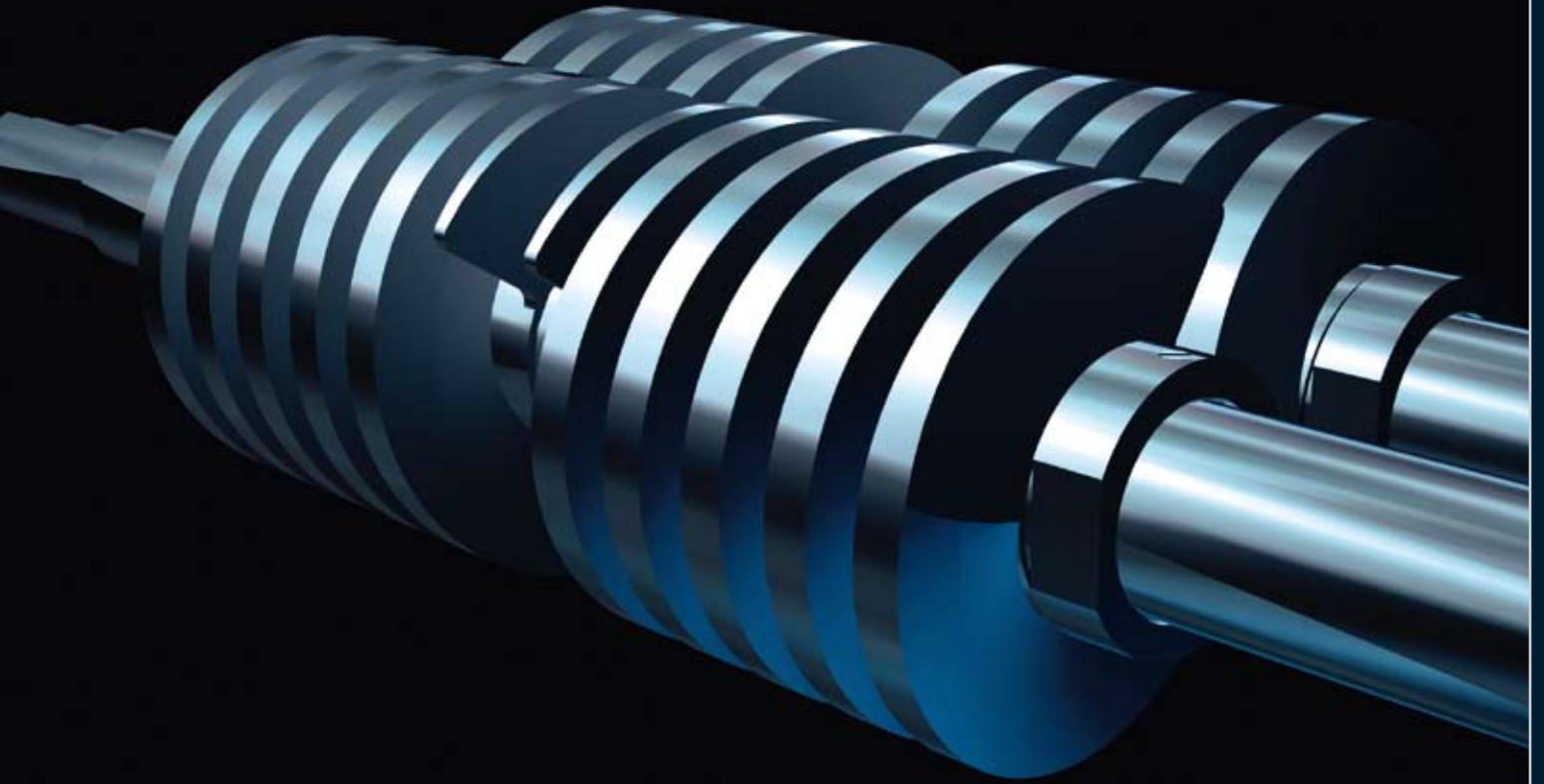
## SELECT – PLUG IN – PUMP OUT

With the benefit of almost 20 years proven experience Bornemann offers customised performance solutions for every situation. In-house design and production and 100% workshop testing guarantee the high performance technology – essential for the oil industry.

## DESIGN RANGE

This highly refined version of the positive displacement principle also employs a patented machining process for the screw manufacture. Performance is a function of screw diameter, pitch and speed. In addition there are special degressive screw geometries available to give a further efficiency saving of up to 25%.





### STANDARD SCREW

The unique rotor design enables Bornemann to maintain a short bearing span and compact pump design. The best suitable material selection for the feed screws and shafts in respect to bending and corrosion resistance.



### DEGRESSIVE SCREW

Screws with a decreasing pitch. Reliable manufacturing process for screws with decreasing pitch. Proven increase in efficiency for multiphase service. Substantial decrease in Total Cost of Ownership by smaller drive train and lower power consumption.

# FROM PUMPS TO SYSTEMS TO SOLUTIONS

CONTACT, CONSULT, SELECT, TRUST BORNEMANN

## COMPLETE MULTIPHASE PUMPING SYSTEMS

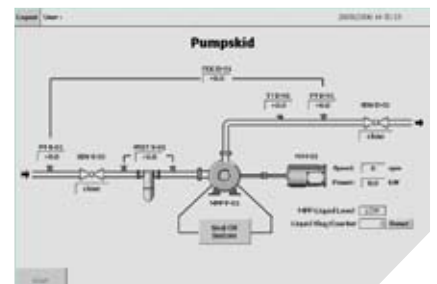
With our experience in research & development, engineering, production and commissioning all over the world we are able to supply complete system solutions – for a wide range of performance conditions and harsh ambient environmental conditions.

## PLUG AND PUMP

The skid mounted pump is equipped with all necessary instrumentation and transformer cabinets. You will get a complete system incl. electrical drive system with motor, variable frequency converter and transformer cabinets will undergo a complete system factory acceptance test prior to shipment.



Cairn Energy India - RAVVA Onshore Terminal





## SAFETY FIRST

The Bornemann system guarantees full safety and automatic operation under all circumstances.

- ▶ Installation of inlet and outlet fail and fire safe ball valves
- ▶ Automatic shut down in case of out of range measuring value
- ▶ Hard wired emergency chains
- ▶ Constantly monitored multiphase process

ONE SMALL STEP FOR A MAN,  
ONE GIANT LEAP FOR MANKIND.  
MULTIPHASE GOES SUBSEA.



## MAINTENANCE-FREE OIL EXTRACTION AT SEABED LEVEL

MOVE BORNEMANN MULTIPHASE  
TECHNOLOGY CLOSER TO  
THE DEEPER AND UNDEVELOPED  
RESOURCES.

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## CONVENTIONAL RECOVERY

Separation at source, flaring and closing down wells with weakened output are wasteful and environmentally unfriendly.



## STRAIGHT TO THE SEABED

Multiphase has gone subsea. Weather and sea conditions are irrelevant. Prolonged production is a reality. The oil industry discovers new profit opportunities.



## THE CHANGE OF PERSPECTIVE

Improved high pressure design means unlimited water depth. Superior execution of pump and motor cartridges are leading the trend to maintenance-free operation. Installations at seabed will last a life-time. The oil industry will change their perspective.

# OUR MULTIPHASE PUMPS AND

## WORK ENVELOPES TO SUITE

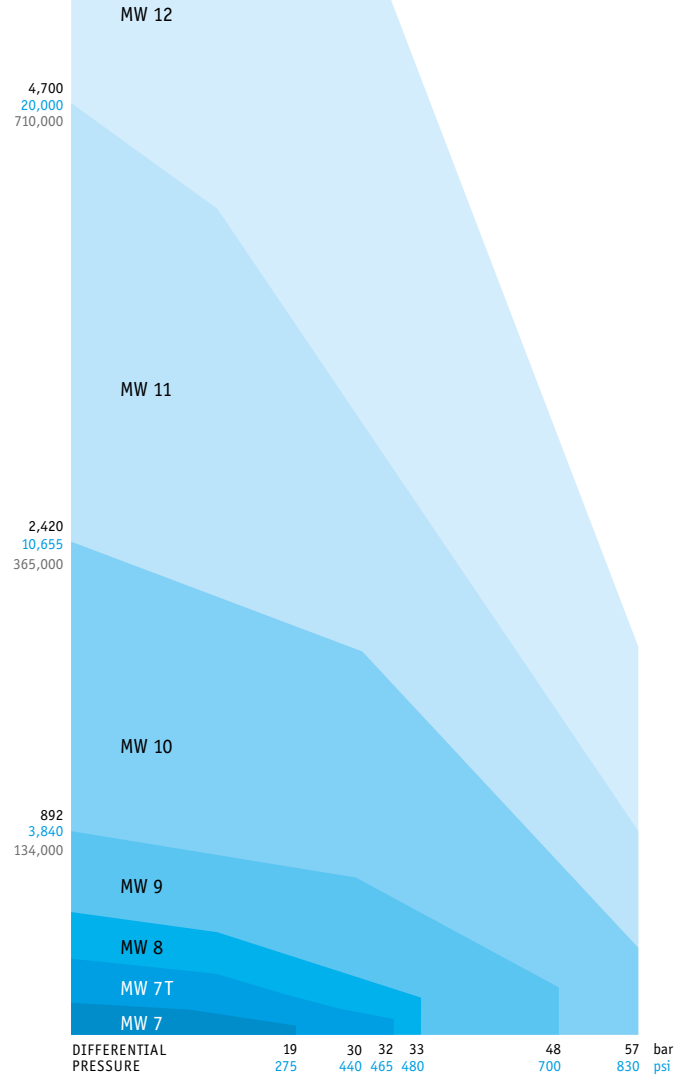
- ▶ Differential pressure: up to 100 bar (1,780 psi)
- ▶ GVF: 0 bis 100%
- ▶ Capacity: 2 to 8,000 m<sup>3</sup>/h (300 to 1,200,000 BPD)
- ▶ Unlimited temperatures and viscosities
- ▶ Inlet pressures down to atmospheric level
- ▶ Pressure rating up to 1,500 lbs
- ▶ All materials, hardened surfaces, and coatings are possible and fulfill common standards such as NACE, PED, ASME, etc. when required.

CAPACITY  
 m<sup>3</sup>/h 8,000  
 gpm 35,200  
 BPD 1,200,000



MW

Classic Multiphase Pump

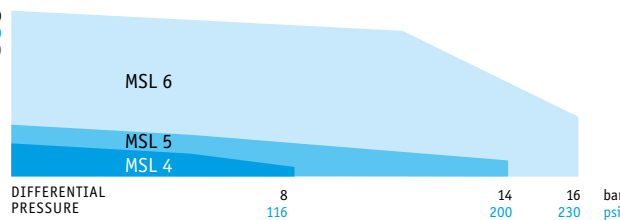


MSL

Single Well Multiphase Pump



CAPACITY  
 m<sup>3</sup>/h 110  
 gpm 490  
 BPD 16,000



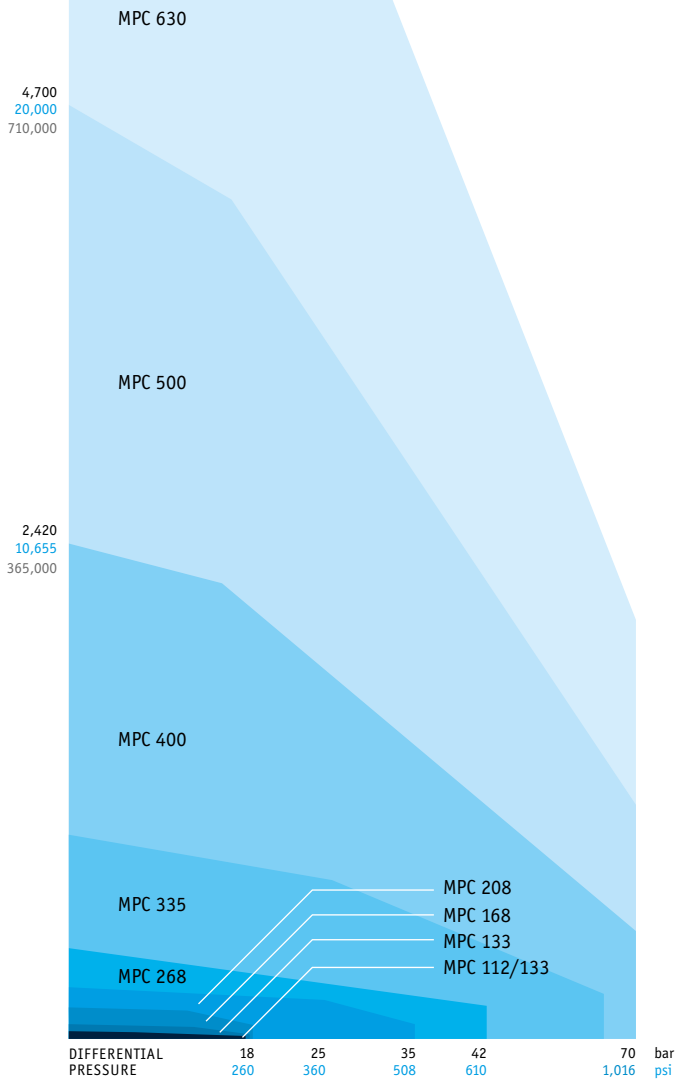
# THEIR WORK ENVELOPE

CAPACITY  
m<sup>3</sup>/h 8,000  
gpm 35,200  
BPD 1,200,000



## MPC

Multiphase Pump Compressor

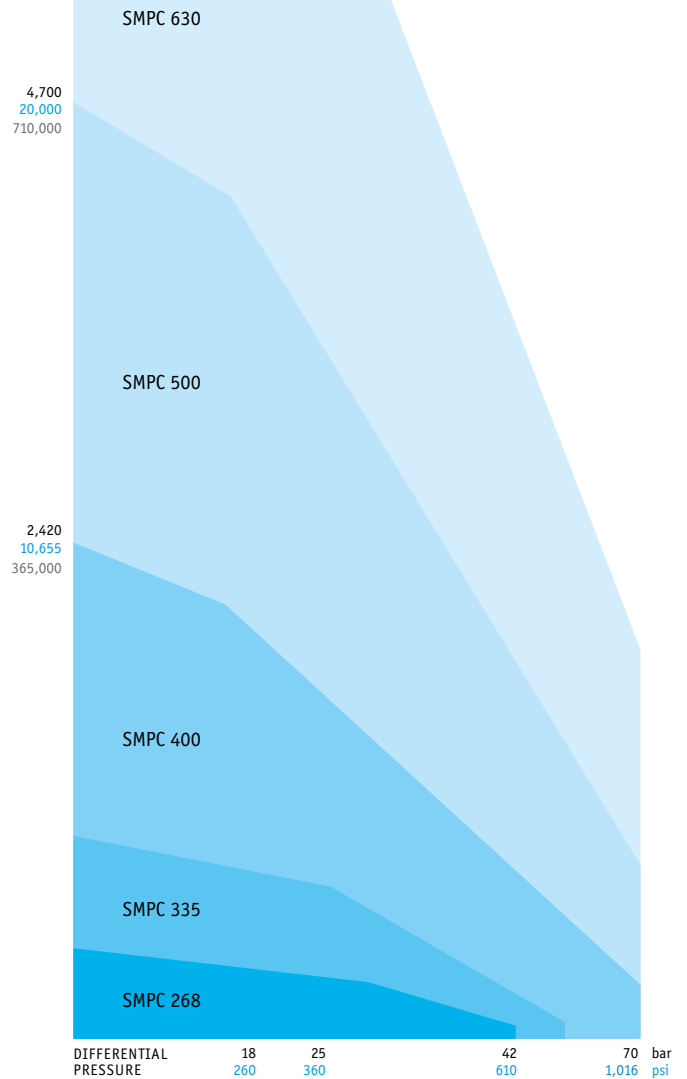


CAPACITY  
m<sup>3</sup>/h 8,000  
gpm 35,200  
BPD 1,200,000



## SMPC

Subsea Multiphase Pump Compressor



# BORNEMANN SERVICES WORLDWIDE

DRIVE, COURAGE, RESPONSIBILITY, RELIABILITY – THAT’S OUR TEAM SPIRIT. IN THE DESERT, AT SEA, IN ICE AND SNOW – WE ARE EQUIPPED FOR EXTREMES. SERVING YOU NIGHT AND DAY – WE HAVE THE KNOW-HOW AND MAINTENANCE CAPABILITY.



Multiphase Testbed

## MAINTENANCE

- ▶ Pump check
- ▶ Inspection
- ▶ Overhaul
- ▶ Multiphase testing
- ▶ Preventive Maintenance
- ▶ Condition Monitoring

## SERVICE ON SITE

- ▶ Specialist Hotline
- ▶ Inspections – Pumps & Systems
- ▶ Maintenance Plans
- ▶ Preventive Maintenance
- ▶ Repairs
- ▶ Mechanical seal service

## SPARE PARTS – WEAR PARTS

- ▶ Consultant Service & Advise
- ▶ On-site stocking proposals
- ▶ High availability from central stocks
- ▶ Excellent backlist availability
- ▶ Rapid delivery worldwide
- ▶ Overnight and courier options



## REPAIR SHOP

- ▶ Rapid job completion
- ▶ Damage and wear inspection
- ▶ Quotes for repair services
- ▶ Optimization of capacity rates for each specific application
- ▶ Adaption of pumps for changed applications
- ▶ Test bed check and performance certificate as standard
- ▶ Pick up and delivery service



On-site Service

## TRAINING

- ▶ Training at Bornemann
- ▶ Training on-site
- ▶ Theory and practice
- ▶ Clear and complete training documentation
- ▶ Systematic operation; maintenance; trouble shooting procedures



Training and Maintenance On-site  
Cost-effective and immediate

## SERVICE LINE

- ▶ +49 5724 390-100
- ▶ [service@bornemann.com](mailto:service@bornemann.com)

# SEVEN OF THE BEST

## OUR CREDENTIALS

### BP

- ▶ BP King – Gulf of Mexico
- ▶ Subsea installation
- ▶ Installed in 2007
- ▶ Fluid Multiphase Mixture
- ▶ Capacity 485 m<sup>3</sup>/h  
73,484 BPD
- ▶ Water depth 1,700 m
- ▶ GVF up to 98%



### CNRL / ESSO / IMPERIAL OIL

- ▶ Thermal Fields in Canada
- ▶ 148 pumps in operation
- ▶ Fluid Multiphase Mixture
- ▶ Capacity up to 2,000 m<sup>3</sup>/h  
303,030 BPD
- ▶ GVF 99%



### PDVSA

- ▶ nearly 80 pumps in operation
- ▶ Fluid Multiphase Mixture
- ▶ Capacity up to 768 m<sup>3</sup>/h  
116,363 BPD
- ▶ GVF up to 99%
- ▶ Heavy Crude Oil





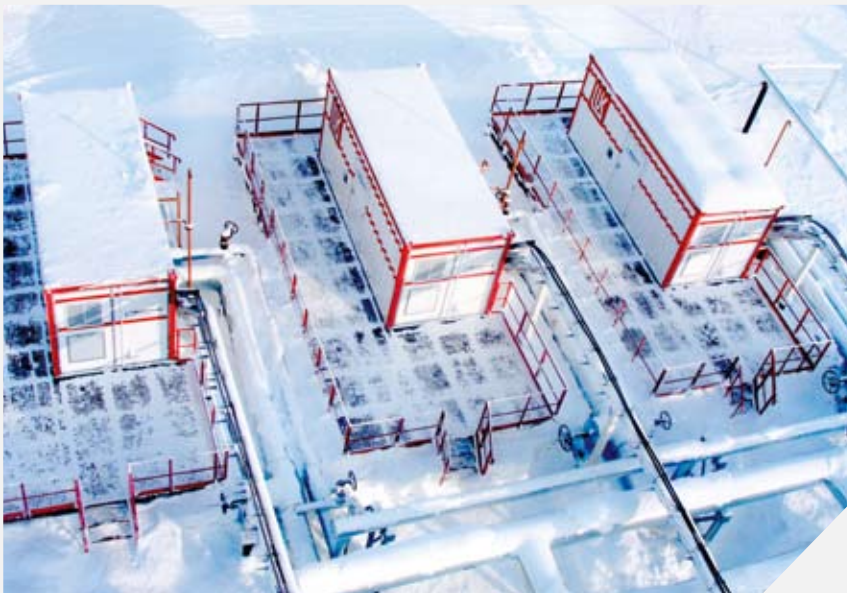
### WINTERSHALL NOORDZEE

- ▶ P12 South West
- ▶ MPC 268
- ▶ Installed in 2005
- ▶ Fluid Multiphase Mixture
- ▶ Capacity 610 m<sup>3</sup>/h  
92,424 BPD
- ▶ GVF 99%



### RWE-DEA

- ▶ Mittelplate – Germany
- ▶ MPC 335
- ▶ Installed in 2005
- ▶ Fluid Multiphase Mixture
- ▶ Capacity 470 m<sup>3</sup>/h  
71,212 BPD
- ▶ GVF up to 74%



### LUKOIL

- ▶ Siberia, Russia
- ▶ Harsh Environmental Installation
- ▶ 100 Installations
- ▶ Capacity up to 500 m<sup>3</sup>/h  
75,757 BPD
- ▶ GVF 96%



### CAIRN ENERGY

- ▶ Ravva Terminal – India
- ▶ Installed in 2007
- ▶ Fluid Multiphase Mixture with H<sub>2</sub>S
- ▶ Capacity 2,414 m<sup>3</sup>/h  
365,757 BPD
- ▶ GVF 95 %

# MEET THE MULTIPHASE-TEAM



Gero von der Wense,  
Leader Bornemann  
Multiphase Boosting Team

## FROM ENQUIRY THROUGH FEASIBILITY STUDY TO HANDOVER

*"Take advantage of our depth of experience. Our team includes Project and Procurement Managers, System Integration Experts and Product Development and Research Groups.*

*Consult our portfolio of completed projects and enjoy the diversity and dependability of immediate professional support!"*



Complete Project-Management ...



... including Transport-Logistics worldwide.



Expert Advice, specific Planning ...



... made in Germany, supplied all over the world.



# WELCOME TO BORNEMANN GERMANY



## OVER 150 YEARS OF TECHNOLOGY DEVELOPMENT

Twin screw and progressive cavity pumps are historically in great demand. Multiphase twin screw pumps are continuing to rise. The variety of uses for Bornemann pumps seems to have no boundaries.



## MILESTONES

▶ 1853	▶ 1934	▶ 1985	▶ 1989
Joh. Heinrich Bornemann opens his Locksmith Shop	Development of twin-screw pumps, patent granted	Development and introduction of multiphase pumps	First field test of multiphase pumps
▶ 1993	▶ 2005	▶ 2006	▶ 2007
First patent for multiphase boosting	First subsea multiphase pump in operation	First 3,000 kW (4035 HP) pumps	World record – 1,700 m deepest subsea multiphase pump in operation

# UNIQUE SOLUTIONS MADE BY THE LEADING COMPANY IN MULTIPHASE SYSTEMS



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