Aker Solutions subsea pumps
An enabling technology for deepwater developments

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Aker Solutions in brief

- Aker Solutions is a global provider of products, systems and services to the oil and gas industry
- Built on more than 170 years of industrial tradition
- Employs approximately 17,000 people in about 20 countries

Employees: **17,000**
Revenues: **29.1 bn**
EBITDA: **2.2 bn**
EBIT: **1.7 bn**
Market Cap: **11.5 bn**

Revenue and profits are in NOK and pro forma for 2013. Market capitalization as of November 7, 2014.
The new Aker Solutions

Uniquely positioned to design, equip, build and maintain future Advanced Subsea Production systems
Aker Solutions’ pump system road map

Since 1815: Thune, Eureka, Kværner pumps for ships & topside applications

1975-2004
>1000 pump

1989-1993
First subsea - KBS

1975-2004
>1000 pump

1989-1993
First subsea - KBS

Topside technology

Feasibility

Qualification

2004-2008
LiquidBooster™

2006-2009
Tyrihans RSWI - 5.4 MW, 34km

2008-2009
Ormen Lange Pilot, 1x400kW

2008-2009
Tyrihans RSWI - 5.4 MW, 34km

2009-2012
Further Qual.
3 MW, 500m³/h
15 kpsi

2010-2014
Åsgard
2+1 x 800kW

2010-2014
Åsgard
2+1 x 800kW

2008-2011
HybridBooster™ – 250 bar Δp SP 30% GVF

2012-2015
MultiBooster™ - 6 MW
1500 m³/h
200 bar Δp SP >100 bar, 70% GVF

Qualification for gas handling

Qualification

LB Execution (EPCs)

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Preferred partner
Aker Solutions’ pump system road map

LiquidBooster™
Qualified & delivered

HybridBooster™
Qualified in JIP

MultiBooster™
Qualification complete 4Q15
Multiphase pump development drivers

- Success of the LiquidBooster™ qualification and its first related EPC

- Multiphase pumping considered as a key enabler for deep fields and long tie-backs
  - High Δp impeller/diffuser development
  - Motor development

- Owning the technology viewed as vital

- Full control of the complete value chain
The MultiBooster™ development

- Development pump design targets:
  - up to 6000 kW
  - 0-100% GVF capability
  - up to 150 bar Δp @ 70% GVF
- Full prototype test 2015

JIP partners:
ExxonMobil, ConocoPhillips and Total
Game changing in several aspects…

Subsea motor:
- 6 Megawatt
- 6000 RPM
- 6.6 kV

- Revolutionary high Δp at high GVF
- More power per pump stage; decreased dimensions
- High pressure water injection ~700 bar Δp
- Enable longer tie-backs
Game changing in several aspects…

Subsea motor:
- 6 Megawatt
- 6000 RPM
- 6.6 kV

Gas tolerant impeller/diffuser

- Aker proprietary design
- Semi-axial impeller/diffuser type
- Eliminates phase separation in pump
- High Δp capability in high GVF conditions
- Standardized size range up to 1500 m³/h
Game changing in several aspects...

Subsea motor:
- 6 Megawatt
- 6000 RPM
- 6.6 kV

Condition monitoring:
Proximity probes in motor and pump

Gas tolerant impeller/diffuser

- Improved monitoring and maintenance planning
- Measures radial & axial displacement of shaft
- Measures bearing temperature
MultiBooster™ typical components

- Transformer
- Pump
- Manifold
- Base frame and suction anchor
MultiBooster™ typical components
Aker Solutions pump portfolio

![Graph showing the performance of different pump models: LiquidBooster™, HybridBooster™, MultiBooster™ 8-Stage.](image)

- LiquidBooster™
- HybridBooster™
- MultiBooster™ 8-Stage

**Axes:**
- GVF [%]
- Pump Δp [bar]

**Legend:**
- LiquidBooster™
- HybridBooster™
- MultiBooster™ 8-Stage
Advanced Subsea Production – the full picture

Uniquely positioned to **design, equip, build and maintain** future Advanced Subsea Production systems
Thank you for the attention

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THE NEXT FRONTIER IN SUBSEA BOOSTING
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