

# Gas and Process Division



**Smart and Clean**

Capital Markets Day 2006

Dré Schmitz, President Gas and Process Division

*Atlas Copco*

**Smart & Clean**

**Natural Gas**

*Atlas Copco*

Capital Markets Day - December 4, 2008

---

---

---

---

---

---

---

---

---

---

---

---

**Driver for Smart and Clean**  
...is the growing demand for energy driven gas power station

Application fuel gas to the main gas turbine

*Atlas Copco*

Capital Markets Day - December 4, 2008

---

---

---

---

---

---

---

---

---

---

---

---

**Increase in Primary Gas Demand**

Year	Power generation	Industry	Residential and services	Other	GTL
1980	0.2	0.5	0.3	0.1	0.0
1990	0.5	0.8	0.4	0.2	0.0
2002	1.0	1.0	0.5	0.3	0.0
2010	1.5	1.0	0.5	0.3	0.0
2020	2.0	1.0	0.5	0.3	0.0
2030	2.5	1.0	0.5	0.3	0.0

Source: IEA World Energy Outlook 2004

*Atlas Copco*

Capital Markets Day - December 4, 2008

---

---

---

---

---

---

---

---

---

---

---

---

## Distribution of Natural Gas

Pipeline



LNG carriers



CNG carriers feasibility study short distance



Global Markets Div. - December 4, 2009

---

---

---

---

---

---

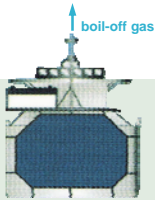
---

---

---

---

## LNG – Liquefied Natural Gas



Liquid form at atmospheric pressure and temperature  $-161\text{ }^{\circ}\text{C}$

Reducing volume by a factor of 610



Global Markets Div. - December 4, 2009

---

---

---

---

---

---

---

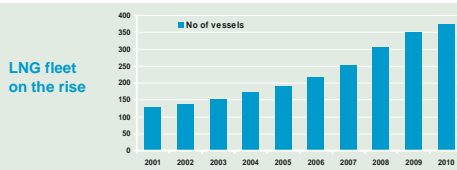
---

---

---

## World LNG Potential

- The 12 countries that currently export LNG have approximately 28 percent of world natural gas reserves.
- Three countries with 33 percent of the world's reserves are currently building their first liquefaction facilities.
- At least seven additional countries, with 19 % of the world's reserves, are potential LNG exporters.



Global Markets Div. - December 4, 2009

---

---

---

---

---

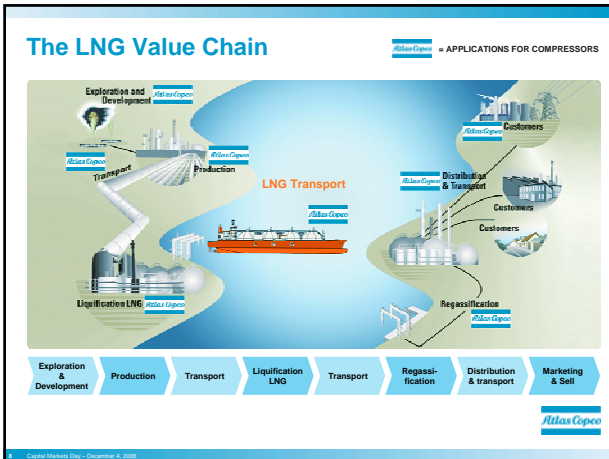
---

---

---

---

---




---

---

---

---

---

---

---

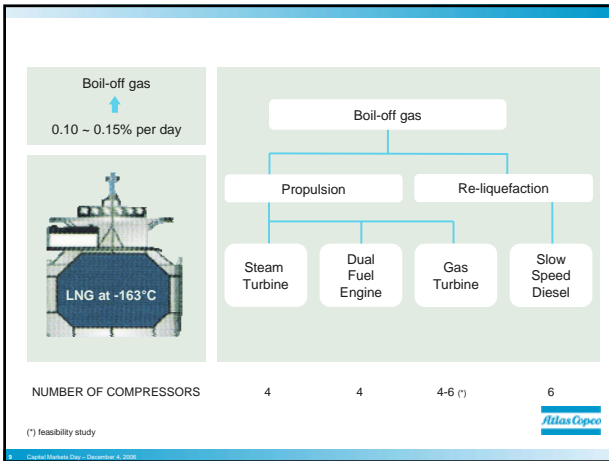
---

---

---

---

---




---

---

---

---

---

---

---

---

---

---

---

---

### Trend

- Traditional steam turbine powered LNG of 135 - 145 tm<sup>3</sup> is virtually a thing of the past
- The majority of new ships currently being specified are
  - 210-217 tm<sup>3</sup> with low speed diesel and on board reliquefaction
  - 150-180 tm<sup>3</sup> with dual fuel diesel electric propulsion
- Forecast 2006 - 2011
  - Steam: 19 vessels (14%) → 76 compressors
  - Dual fuel: 69 vessels (50%) → 276 compressors
  - Reliquefaction: 51 vessels (36%) → 306 compressors

Atlas Copco

Global Markets Div. - December 4, 2009

---

---

---

---

---

---

---

---

---

---

---

---

### LNG Equipment from Atlas Copco

SHIP'S PROPULSION SYSTEM		STEAM TURBINE	DUAL-FUEL ENGINE	GAS TURBINE	DIESEL & DIESEL ELECTRIC
S.O.M. REFRIGERATION COMPRESSORS	L/D compressor, single-stage	✓			
	L/D compressor, two-stage		✓		
	L/D compressor, multi-stage			✓	
	H/D compressor, single-stage	✓	✓	✓	✓
RELIQUEFACTION COMPRESSORS & EXPANDERS	Nitrogen compressor				✓
	Nitrogen booster expander				✓
	Nitrogen compressor				✓
	BOG compressor, two-stage				✓
HEATERS AND VAPORIZERS	L/D gas heaters	✓	✓	✓	
	L/D forcing vaporizer	✓	✓	✓	
	Mist separator		✓	✓	
	L/D combined vaporizer / gas heater		✓	✓	
	H/D gas heaters	✓	✓	✓	✓
	LNG vaporizer	✓	✓	✓	✓
	BOWU heater	✓	✓	✓	✓

Atlas Copco

11 - Coastal Markets Div. - December 4, 2009

---

---

---

---

---

---

---

---

---

---

---

---

---

### Combined gas heater / vaporizer New Technology

Atlas Copco

12 - Coastal Markets Div. - December 4, 2009

---

---

---

---

---

---

---

---

---

---

---

---

---

### LNG - Reliquefaction

#### First generation

#### Second generation

800 kW savings

Atlas Copco

13 - Coastal Markets Div. - December 4, 2009

---

---

---

---

---

---

---

---

---

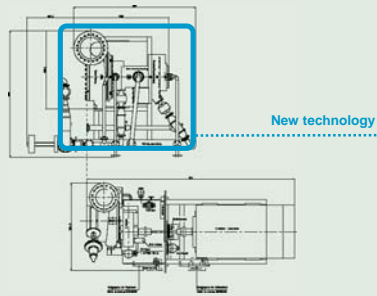
---

---

---

---

### Size Comparison – HD Compressor



14 - Global Markets Div. - December 4, 2009

---

---

---

---

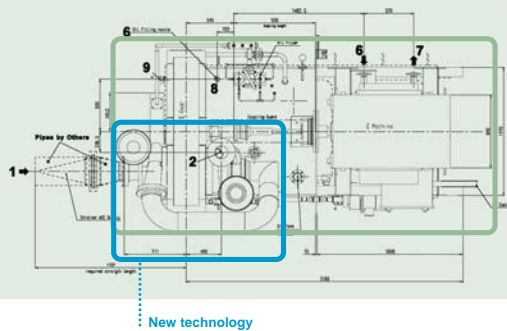
---

---

---

---

### Size Comparison – LD – BOG 2 Stage



15 - Global Markets Div. - December 4, 2009

---

---

---

---

---

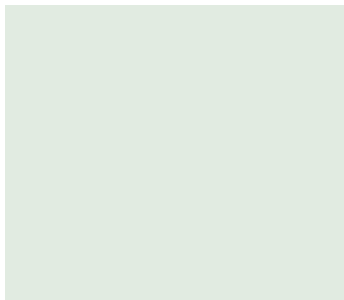
---

---

---

### High Speed Direct Drive Compressor

#### New Technology



#### Advantages:

- Weight and space reduction
- Efficiency improvement
- No gear box required
- No lube oil system required
- Life cycle cost reduced

play movie

continue



16 - Global Markets Div. - December 4, 2009

---

---

---

---

---

---

---

---

## Example for Energy Recovery

Not for LNG



Zandvliet – GT098 L4K1 + 2x ETI 450 NS

### Process conditions GT098 L4K1

- Medium Air
- Inlet pressure 0.97 bar A
- Discharge pressure 10.75 bar A
- Flow 102.232 m<sup>3</sup>/hr
- Shaft power 12,310 kW

### Process conditions Twin ETI 450 NS

- Medium N<sub>2</sub>
- Inlet pressure 8.00 bar A
- Discharge pressure 1.35 bar A
- Flow 41,000 Nm<sup>3</sup>/hr each
- Shaft power 2,232 kW

Energy savings



17 - Capital Markets Day - December 4, 2020

---

---

---

---

---

---

---

---

---

---

## Gas and Process Division

### Summary

- LNG demand is growing 8% per year
- The growth is driven by gas power stations
- We have developed the products together with our customers
- Technology can also be used for other applications
- The technology used contributes to a better environment and energy savings



18 - Capital Markets Day - December 4, 2020

---

---

---

---

---

---

---

---

---

---

**We are committed to your superior productivity through interaction and innovation.**



19 - Capital Markets Day - December 4, 2020

---

---

---

---

---

---

---

---

---

---



---

---

---

---

---

---

---

---