

# 32<sup>nd</sup> International North Sea Flow Measurement Workshop 21-24 October 2014

## Extended Abstract

### FORCE Technology Builds the World's Largest Calibration Loop for Calibration of Natural Gas Metres

**Lead Author, FORCE Technology**  
**Jesper Busk, Head of Department**

---

The increasing global demand for calibration of gas metres at high pressure has led to FORCE Technology erecting the world's largest calibration loop for calibration of natural gas metres.

The system will be ready for operation in the fall 2014.

Exact measurements of gas flow provide correct price settlements. It is extremely important that the gas flow metres show as exact measurements as possible. Every year, gas amounting to billions of Euros flow through the large metres applied for settlement when the gas crosses frontiers. Even if the metre's inaccuracy percentage is as low as e.g. 0,5, it will result in huge errors in the settlement amounts.

#### **In-house developed technology**

The new system is build with FORCE Technologys inhouse developed technology, where natural gas is circulated in a closed loop.

Already in 2004, FORCE Technology began using their first system with this technology and established a prototype system, which circulates up to

- 10.000 m<sup>3</sup>/h natural gas
- at a pressure of up to 50 bar

#### **Demand requires larger facilities**

Today, the market requires larger facilities, and the new system consists of a closed loop, dimensioned for a pressure of up to

- 65 bar

and a flow of no less than

- 32.000 m<sup>3</sup>/h natural gas
- 41.000 m<sup>3</sup>/h natural gas at lower pressures.



# 32<sup>nd</sup> International North Sea Flow Measurement Workshop 21-24 October 2014

## Extended Abstract

The heart or rather the hearts of the system consist of two parallel connected high pressure blowers, each producing up to 20.500 m<sup>3</sup>/h and circulating the gas in the loop at a variable pressure from 3-65 bar.

The high pressure blowers are driven by two 900 kW engines which makes it possible to calibrate metres with diameters of up to 750 mm in the system, or even higher on demand.



### Major Enhancements, improvements & developments

- Advanced monitoring of working standards
- Compressor 2 meter long auto-lock and wireless controlled
- Outstanding pressure- and temperature stability
- System stability time between points and runs within seconds
- System pressure change within minutes
- Large 1<sup>st</sup> floor visitors room with direct screen access to calibration results
- Advanced high pressure performance data acquisition- and control system
- The overall facility is developed and designed by **FORCE Technology**

### Specification of capacities

Calibration pressure:	0-65 bar
Flow range:	20-32.000m <sup>3</sup> /h (41.000 m <sup>3</sup> /h at lower pressure)
Power consumption:	1.800 kW (2.338 bHp)
Meter sizes:	4 inch – 30 inch (42 inch on demand)
Total straight run length:	25.000 mm
Maximum Normal flow:	2.500.000 Nm <sup>3</sup> /h

# 32<sup>nd</sup> International North Sea Flow Measurement Workshop 21-24 October 2014

## Extended Abstract

### Historic - Flow measurement at FORCE Technology

- 1985 Facilities for calibration of gas metres , atmospheric air - 4.000 m<sup>3</sup>/h
- 1992 Facilities for calibration of gas metres, 0-8 bar air - 1.000 m<sup>3</sup>/h
- 2003 Facilities for calibration of gas metres, 0-50 bar natural gas - 6.500 m<sup>3</sup>/h
- 2004 Primary system for generating of the unit m<sup>3</sup>/h  
atmospheric air, 10 m<sup>3</sup>/h
- 2006 Facilities for calibration of gas metres, 0-35 bar natural gas - 10.000 m<sup>3</sup>/h
- 2012 Primary system for generating of unit m<sup>3</sup>/h., atmospheric air, 100 m<sup>3</sup>/h
- 2013 Primary system for high pressure calibration, 0-100 bar natural gas -400  
m<sup>3</sup>/h
- 2014 Facilities for calibration of gas metres, 0-65 bar natural gas - 32.000 m<sup>3</sup>/h  
(41.000 m<sup>3</sup>/h at lower pressure)

### Traceability

The traceability system at FORCE Technology is based on a hydraulic driven twin High Pressure Piston Prover.



## 32<sup>nd</sup> International North Sea Flow Measurement Workshop 21-24 October 2014

### Extended Abstract

#### International primary system at FORCE Technology

FORCE Technology has completed a primary system, which generates the unit  $\text{m}^3/\text{h}$ . The system provides traceability to the new high pressure calibration system minimizing the calibration inaccuracy to the absolute minimum.

The primary system was internationally approved in 2013, and FORCE Technology now joins the European cooperation on Harmonization of The European Natural Gas Cubic Metre (EUREGA).

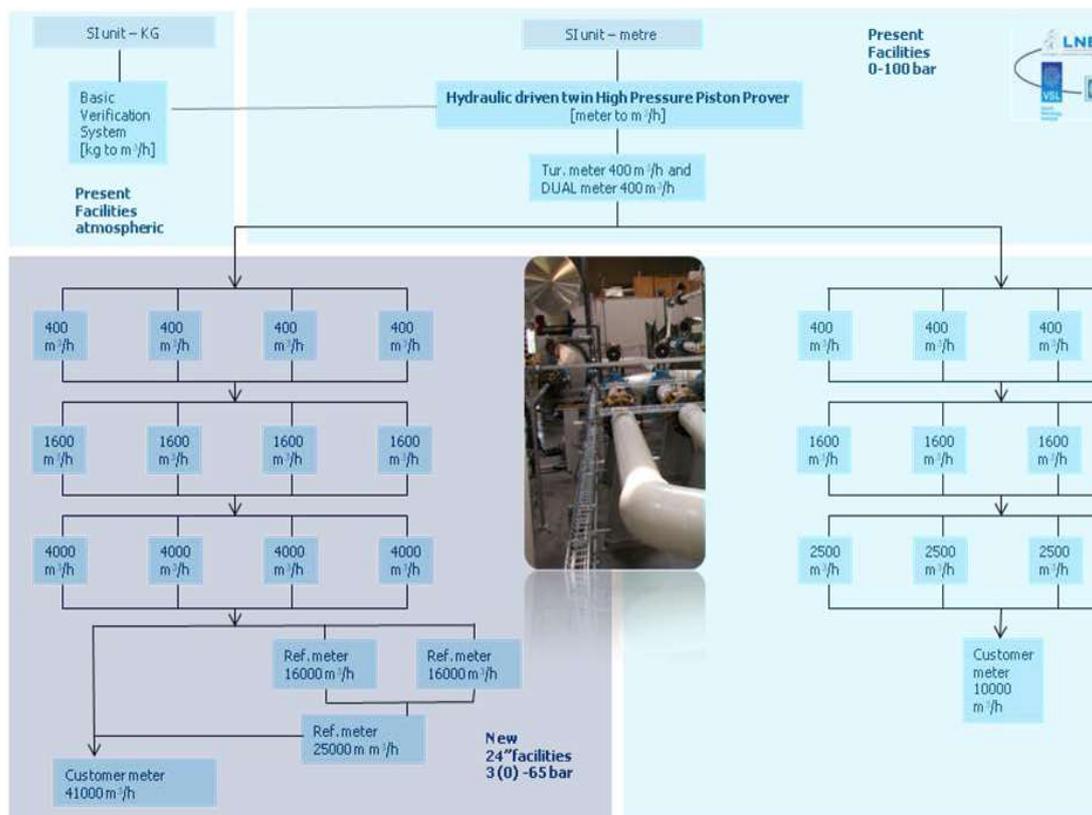


Fig. 1 – Traceability System at FORCE Technology

Jesper Busk,  
Head of Department Gas flow  
FORCE Technology, Denmark



## References

[1] Paper presented at the North Sea Flow Measurement Workshop, a workshop arranged by NFOGM & TUV-NEL

Note that this reference was not part of the original paper, but has been added subsequently to make the paper searchable in Google Scholar.