
OptoSense

Product and Company presentation

February 9th 2011 – Terje Hanserud

Business idea and product

OptoSense develops and sells micro-optical sensors for demanding gas detection and measurement applications.



The first products measure Indoor Air Quality (IAQ) to optimize ventilation
• Next application could be Fire&Gas detection or Anesthetics monitoring

Laboratory-style gas measurements with
• Small size, low weight, low power
• Low cost in volume production
• Proven accuracy and long-term stability

Key sources of uniqueness

- Unparalleled accuracy and stability
- Multi-gas measurements at same cost

Market

- Building Automation Industry 
 - i.e. Johnson Controls, Honeywell, Siemens, Schneider
 - 600 MNOK(2009) + 20% growth
- Safety/ Industrial Sensors 
 - i.e. Honeywell, Dräger, General Monitors, Autronica
 - 2 BNOK (2008) + 5% growth
- Medical Equipment Integrators 
 - i.e. Dräger, GE Health, Getinge, Philips, Criticare
 - 300 MNOK (2008) + 10% growth

Commercial status

- Sales and production of full range of indoor air quality sensors
- Next application under development

Value drivers and milestones

- Create industrial credibility through delivery of first industrialized IAQ products in fall 2009
- Establish strong partner relationships
- Enter major development agreement with strong market player(s) in higher value application areas

Technology and IPR status

- Exclusive IP rights for gas detection and measurement applications of Diffractive Optical Elements patent (WO00244673A, with Sintef and Tomra)
- Technology proven for other applications
- Strong general patent

Company and organization

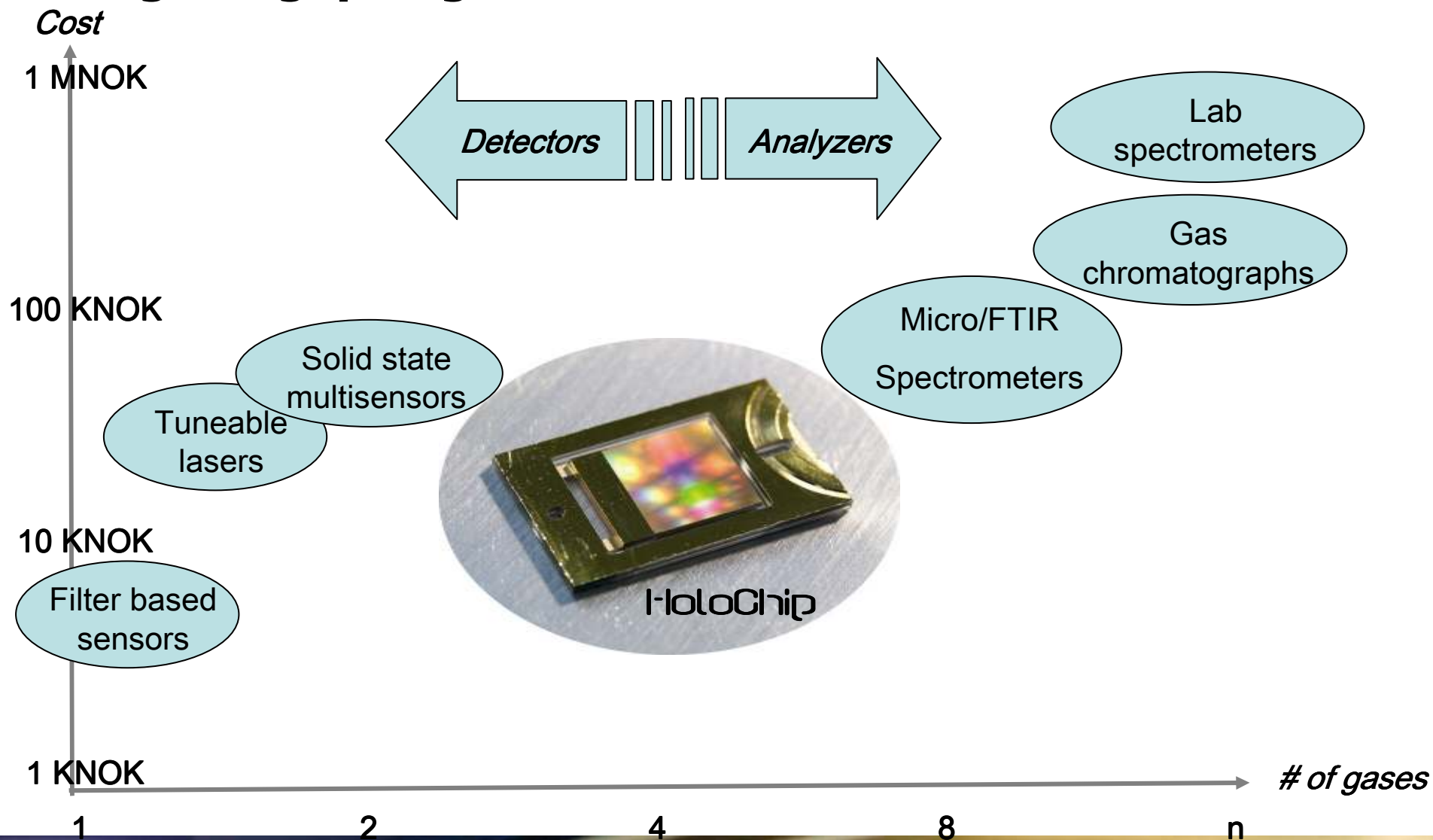
Core team with strong networks:

- CEO: Terje Hanserud, M.Sc. Prev. Norsk Data and Tomra
- Production Manager: Nils Ragnar Liholt M.Sc. Production, Prev. Tandberg D
- SW Engineer: Jørgen Rygh
- Calibration&Test: Kim Espen Nyhus, B.Sc. Electronics, Prev. dev. and test

Supported by strong partners:

- Long term finance through seed-venture capital funds ProVenture Seed, Alliance Venture and Sintef Venture.
- International network for outsourced production.
- Research partner – Sintef, strongest R&D institution in Nordic region.
- Technology advisor & Founder: Trond Melen, Dr.Ing. and MBA, Prev. Sintef
- Located by Oslo University Campus

Filling the gap in gas measurements



The HoloChip Technology

A Holographic mirror that integrates:

- ❖ Diffractive gratings
- ❖ Focusing lenses
- ❖ Beam splitter functionality
- ❖ Wavelength reference

Simple and robust manufacturing:

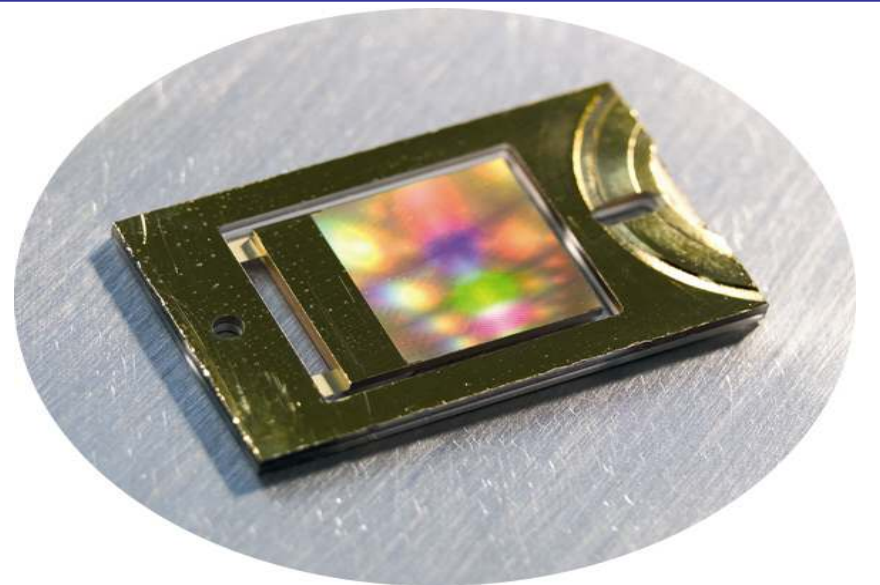
- ❖ Moulded as a CD

Laboratory-style gas performance with

- ❖ Small size, low weight, low power
- ❖ Low cost in volume production
- ❖ Proven accuracy and long-term stability

Patented in major markets

NO 321629, US 7196791,
CN 1488071, WO 0244673 etc



- ❖ Achieved by multi waveband measurement, but with only one light source, one optical path and one detector
- ❖ Robust to ageing of light source, detector, amplifier and voltage references
- ❖ Robust to oxidation of mirrors and dust on mirrors

Sensors for Demand Controlled Ventilation (CO2 and temp.)

Demand Controlled Ventilation with CO2 measurement boosts energy efficiency in both new and refurbished buildings.

The major savings are achieved in buildings with high standards for indoor climate and with large variations or low predictability in occupation. The sensors from

OptoSense yield a higher accuracy and better long term stability, resulting in excellent Indoor Air Quality with the lowest energy and operational costs.

***Accuracy
Long term stability
No maintenance
Easy to install***

OptoSense AS



«What you cannot measure, you cannot control!»



Demand to CO₂ sensor	OptoSense fulfils due to	Other sensors may
<i>Measurement accuracy better than +/- 30 ppm CO₂ (and +/- 0,5°C) to adapt efficiently to the building load.</i>	<i>A robust and well balanced measurement system.</i>	<i>Lead to lower set-points and over-ventilation that marginalize the energy savings.</i>
<i>Stability throughout the lifespan of the building without maintenance.</i>	<i>Single path measurements with fixed moulded references.</i>	<i>Need regular calibration or adjustment upon changes in usage or floor layout.</i>
<i>Independence of continuous occupancy, variations in usage, seasonal BMS changes etc.</i>	<i>Measurement of absolute CO₂ level independent of background concentration.</i>	<i>Not be used in buildings with 24/7 occupancy and may incur seasonal changes to indoor climate.</i>

"A very valuable piece in the puzzle!"



Value	Short term	Long term
To developer	<i>Meet the demands in EU Directive on energy performance of buildings and achieve a better energy classification.</i>	<i>The building is prepared for higher energy prices and stricter regulation. Collect higher rates as energy cost attract more tenant focus.</i>
To tenant	<i>Lowered energy bill (up to 200 €/year per sensor) and less complaints on indoor climate.</i>	<i>Annual savings on energy. Increased productivity and general well-being among staff.</i>
To HVAC subcontractor	<i>Simple installation and commissioning.</i>	<i>Moving from a problem-driven to value driven post-sale market. From trouble-shooter to energy consultant.</i>

OptoSense Energy Calculator

OptoSense Calculator - Energy saved with Demand Controlled Ventilation

KEY DATA FOR ZONE

Size of zone:	90 m ²	10 t ventilation	Occupancy:	> 90 %	90 - 50 %	50 - 10 %	< 10 %	Tot. Occupied
Max occupancy:	10 people	14 hours min	Hours/day	1	1	1	1	4
Airvolume:	485 m ³ /t day	63 m ³ /t night	People	9.5	7	3	0.5	Average
Airvolume:	5732 m ³ /day	1606880 m ³ /year	People, weighed	9.5	7	3	0.5	5.0

KEY HVAC PARAMETERS

			Demand based on:	Presence	Regular CO ₂	OptoSense or similar	Timer only
Vent. Heating	<input checked="" type="checkbox"/>		m ³ /t day	485	433	355	485
Vent. Cooling	<input checked="" type="checkbox"/>		m ³ /t night	63	63	63	63
Heat/Cool Recovery	<input checked="" type="checkbox"/>		m ³ /hours day	3200	2992	2680	5732
			m ³ /year m ²	10821	10243	9376	17854
+Ventilation heating	5.9 W	59.6 kWh	Airvolume VAV/CAV %	56 %	52 %	47 %	100 %
+Ventilation cooling	2.8 W	28.3 kWh	Fan kWh/year/m ²	16.2	12.3	9.4	26.8
-Heat/Cool recovery	-7.0 W	-70.7 kWh	Heat/Cool kWh/year/m ²	9.6	9.0	8.0	17.2
= Net/(m ³ air) (t/m ²)	1.7 W	17.2 kWh	Ventilation kWh/year/m ²	25.8	21.3	17.4	44.0

ENERGY SAVED BY:

	Presence	Regular CO ₂	OptoSense or similar
Reduced airvolume/day	2532	2740	3052
Reduced airvolume/year/m ²	7033	7611	8478
Reduction in kWh/year/m²	18	23	27
Reduction in kWh/year	1620	2070	2430
Reduction in €/year	162	207	243

Update

Note: The calculator uses a simplified model based on airvolumes, occupancy and different sensors used for DCV. The model is based on North European climate (Oslo) and normalized towards a series of simulations with different parameters in the advanced SIMIEN energy modelling tool.



Try it out on www.optosense.com

Some Norwegian installations



- Bank in Trondheim (Sparebank1) with YIT
 - Athletics Centre in Bergen with GK Group
 - Nordstrand primary school in Oslo with JCI. Benchmark for Oslo School Authority in Sintef research project.
 - Kamfjord Nursing Home, Sandefjord med JCI
 - Brannfjell secondary school in Oslo with JCI
 - Nydalen upper secondary school in Oslo with JCI. Largest installation 135 sensors.
 - Community Centre in Ås with JCI
 - Kindergarten in Ringsaker (Bakkehaugen) with TROX Auranor
 - Church at Geilo with OK Ventilasjon
 - Premium office building, Oslo for Olav Thon group (Rosenkrantzgt.16-18) with KlimaControl
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- Long term tests and monitoring on 10+ different locations over the last 3 years.*

Ongoing tests and qualification projects with several potential international partners.