

# ***Ambient air monitoring IR gas sensors go into mass production***

## ***- CO<sub>2</sub> sensors go low-cost***

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- CO<sub>2</sub> sensor cost and market evolution
- Recent trends and product examples
- SenseAir high volume production line

# SenseAir AB

## Company information...

**Turnover (yr 2004):**      *~4 MEURO*

**Growth (1993-2004):**    *21 %/year*

**Employees:**                *42 persons*

**Location:**                  *Delsbo*



**Golden** Infrared Waveguide Gas Sensing Technology  
Peak performance by precision replication...



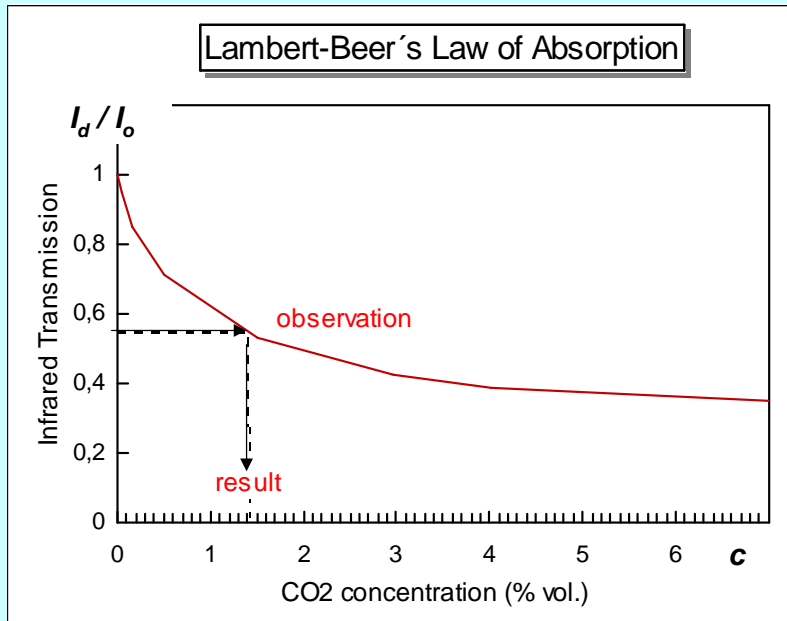
Research, Development,  
Production, and Marketing  
of

SenseAir low-cost IR  
systems for gas sensing...



# SenseAir IR technology

Length matters !!



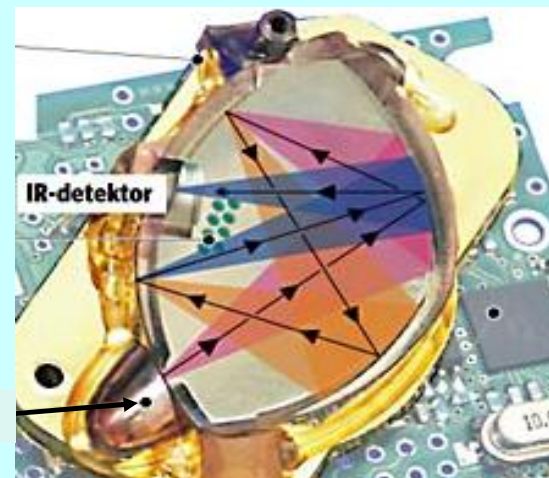
**Lambert-Beer's law:**  $I_d = I_o e^{-c d s}$

$I_o$  is the incident light intensity,

$I_d$  the transmitted light intensity,

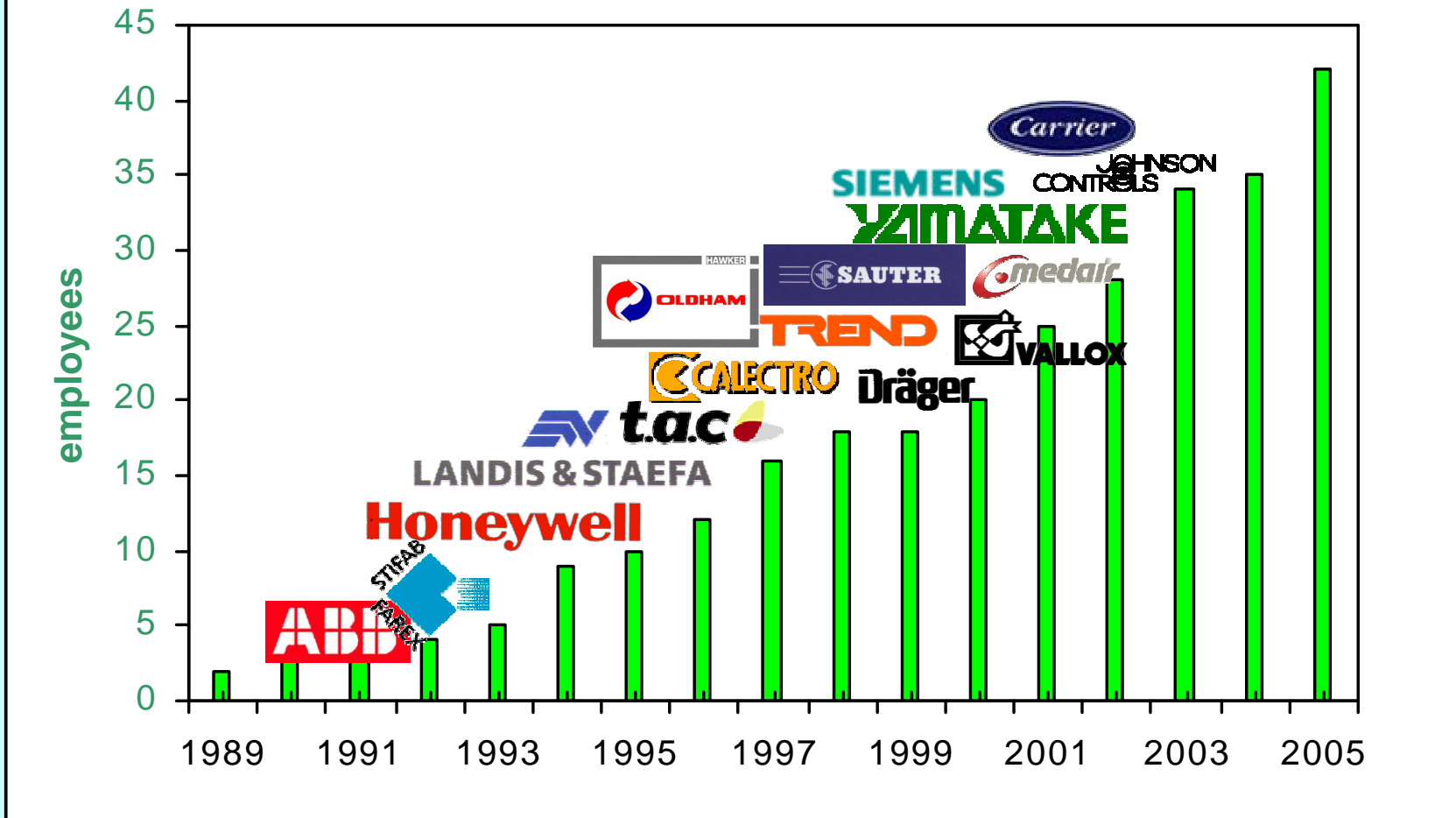
$d$  the optical path length

$s$  the molecular transition strength



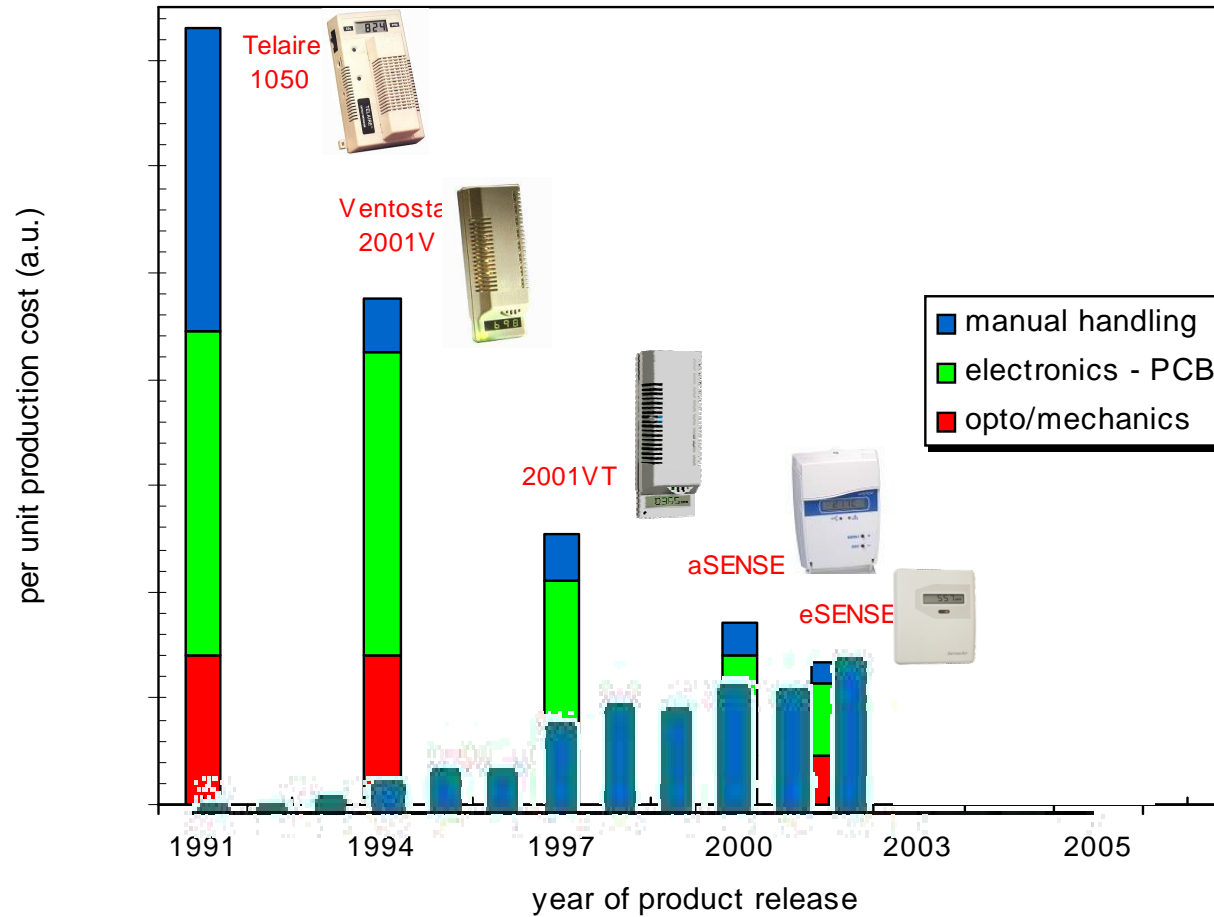
The folded optical path results in a very long path length and a very sensitive, yet quite small, device!

# SenseAir AB Company Development



SenseAir at MONTIE, 2005-11-25

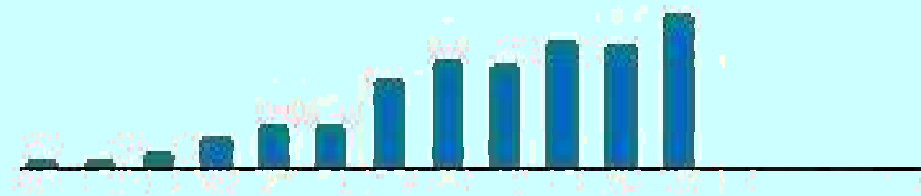
## SenseAir IR gas sensor technology production cost evolution



## Lessons learned from the '90<sup>th</sup>...

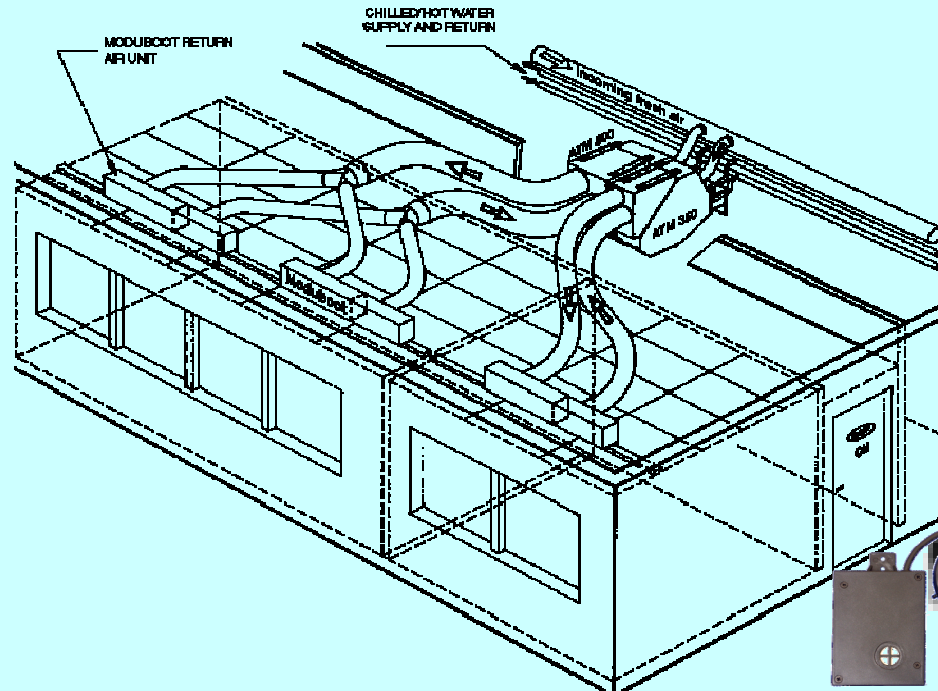
The sensor market growth is hindered by:

- High wiring and installation cost
- Market education and information distribution problems
- Conservatism and complex market structure

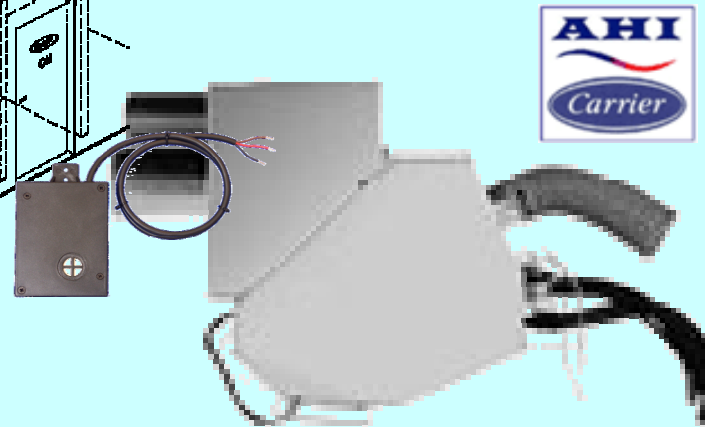


# Factory mounted DCV CO<sub>2</sub> sensors

Carrier ATM...



Requirement of  
*maintenance free*  
sensors!



**42GR ATM: Air Treatment Module**



# Factory mounted DCV CO<sub>2</sub> sensors

## Metropolitan Subways...

The transportation markets require *environmentally robust and stable sensors!*



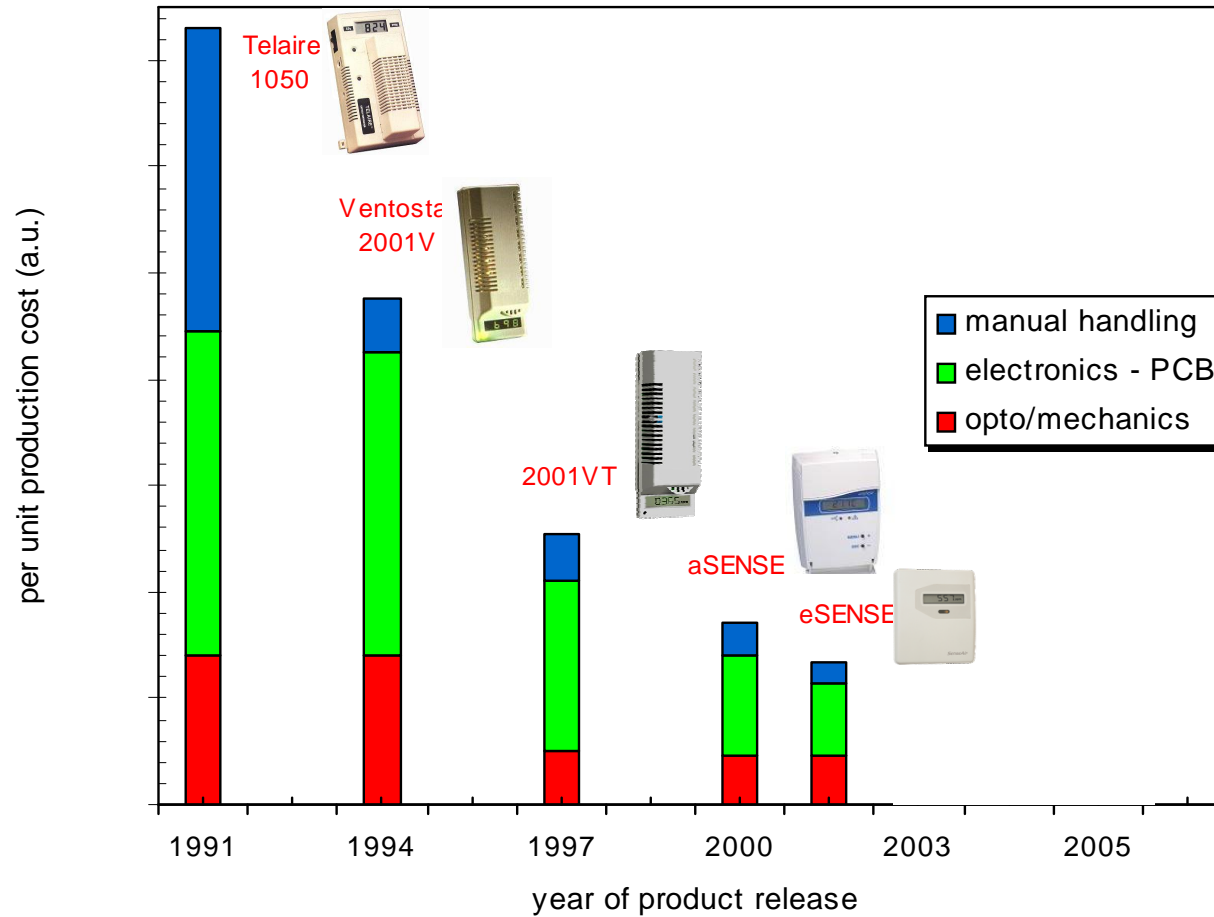
*SenseAir at MONTIE, 2005-11-25*

# Ways to reduce installation costs

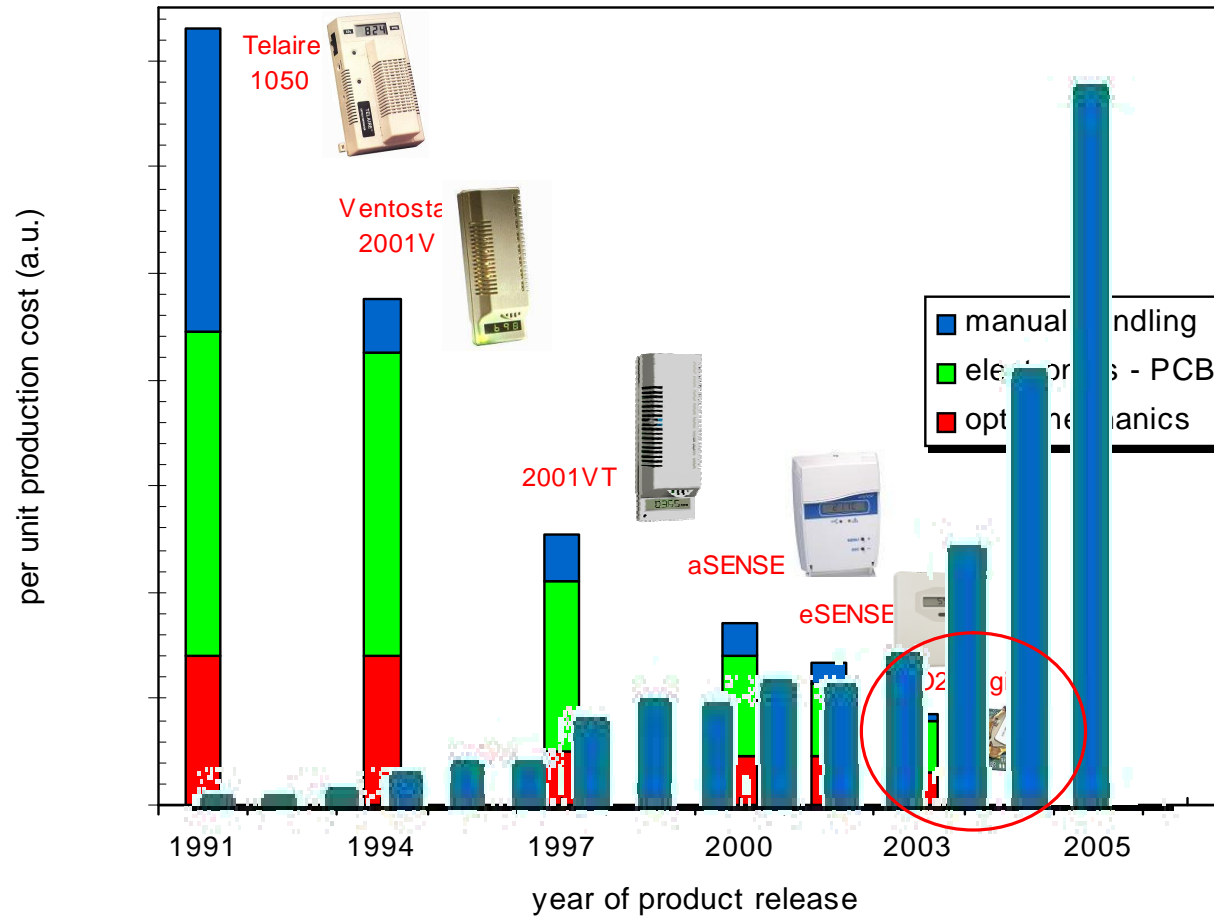
SenseAir development directions and  
business opportunities:

- Incorporate the sensors into other necessary equipment
- Use wireless technology
- Power over Ethernet

## SenseAir IR gas sensor technology production cost evolution

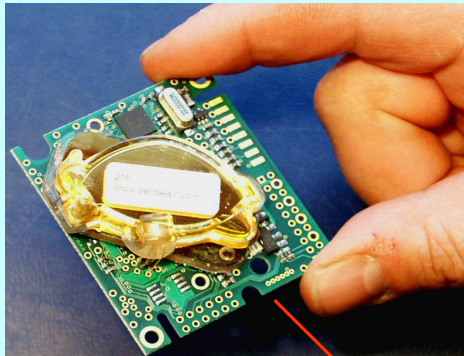


## SenseAir IR gas sensor technology production cost evolution



# Plug-in CO<sub>2</sub> sensor OEM modules

## LINDINVENT AB

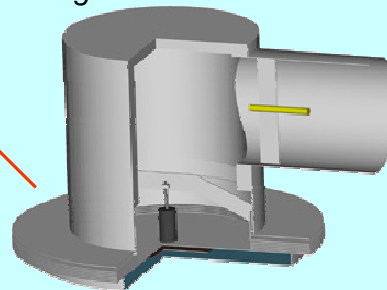


**CO<sub>2</sub>Engine®**



Variable Air Volume supply

IDCC - Intelligent Diffuser for Climate Control



**STORA**  
INNEKLIMATPRISET

*SenseAir at MONTIE, 2005-11-25*

 **SenseAir**

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# Plug-in CO<sub>2</sub> sensor modules

Clock radio DCV from Korea...



*SenseAir at MONTIE, 2005-11-25*

# Plug-in CO<sub>2</sub> sensor modules

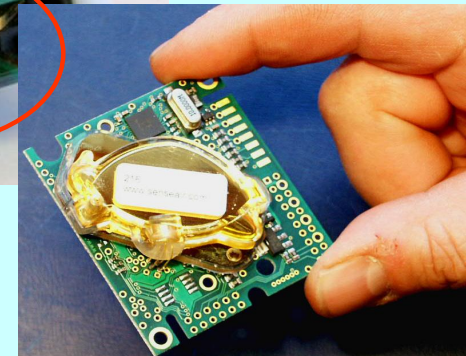
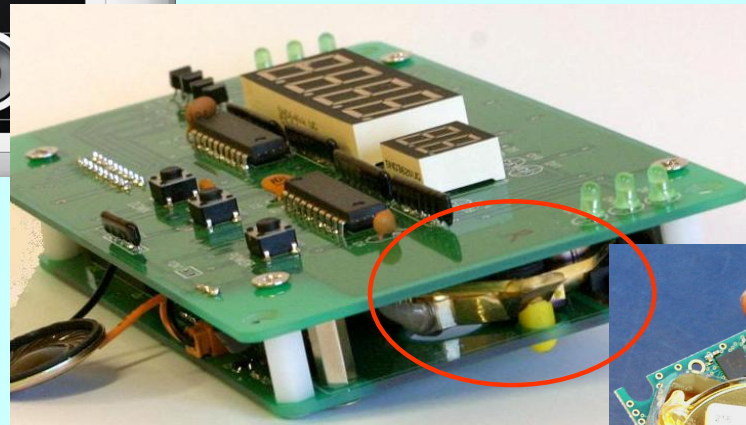
Clean Air Tec fair, Korea Oct.5-7, 2005



*SenseAir at MONTIE, 2005-11-25*



# Plug-in CO<sub>2</sub> sensor modules



*SenseAir at MONTIE, 2005-11-25*

**CO<sub>2</sub>Engine**  
**SenseAir**

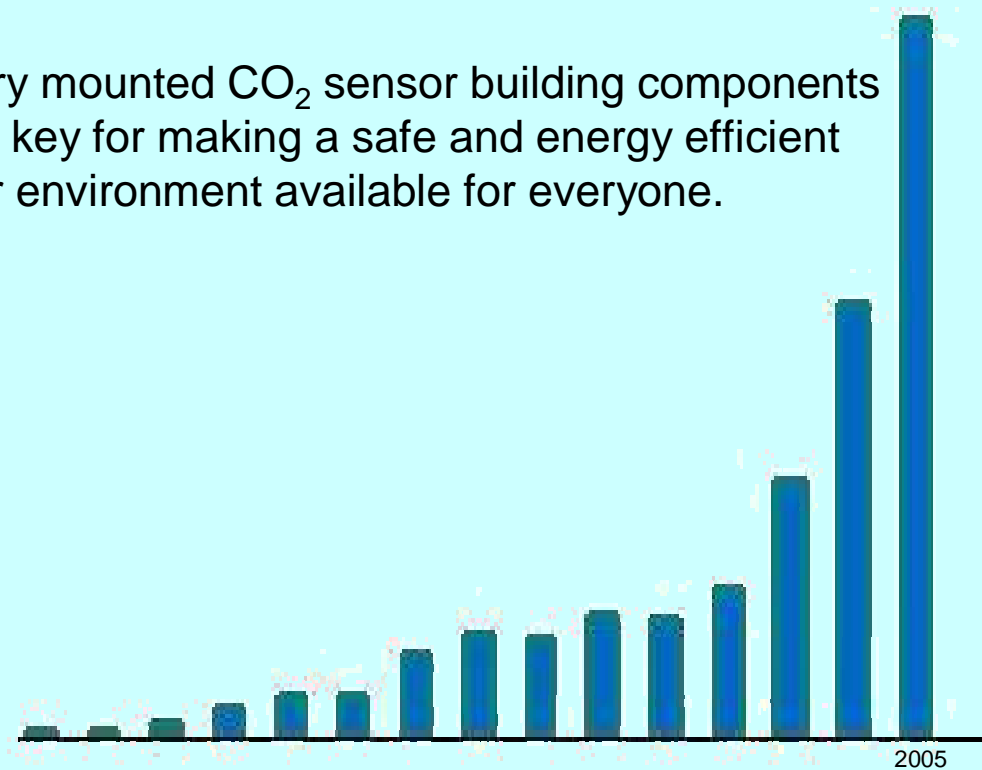
16



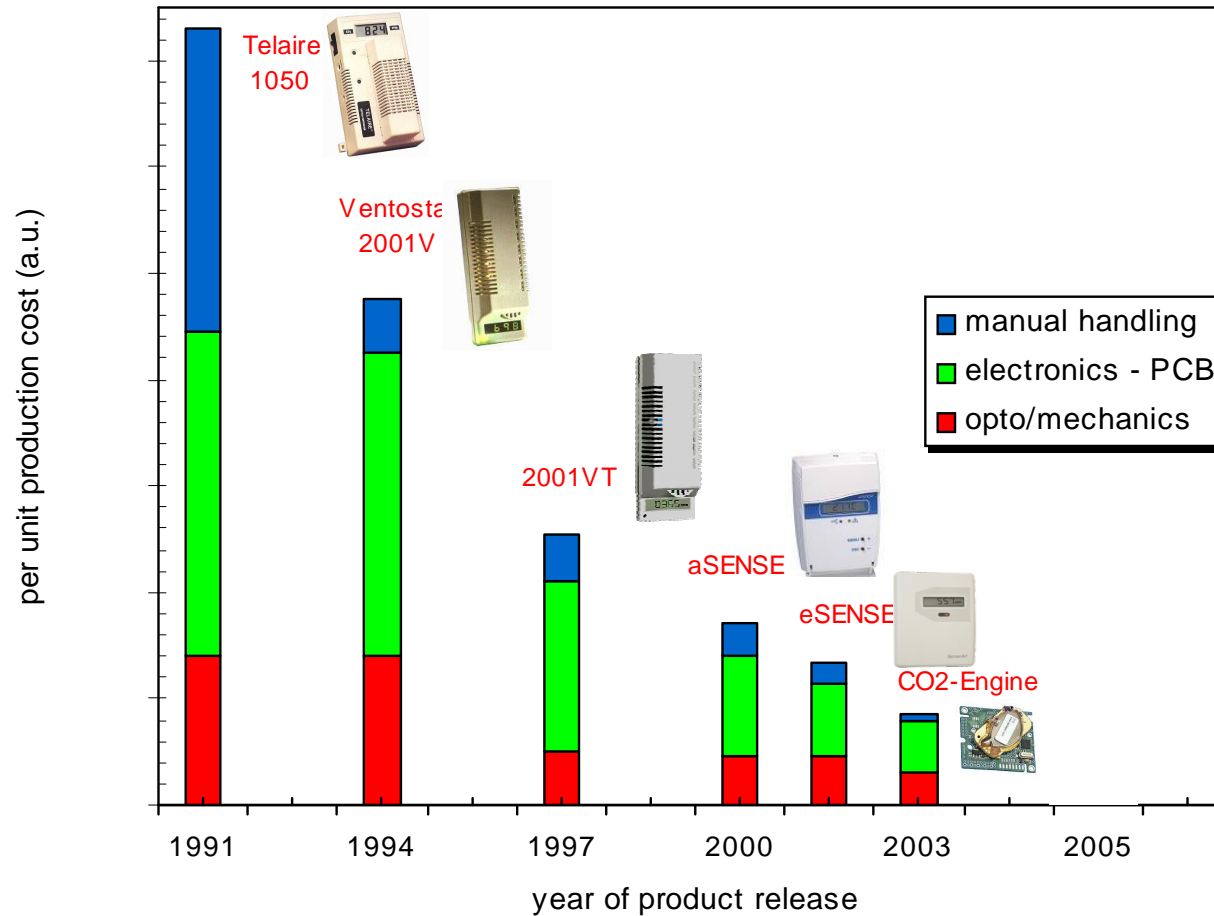
# SenseAir AB

conclusion...

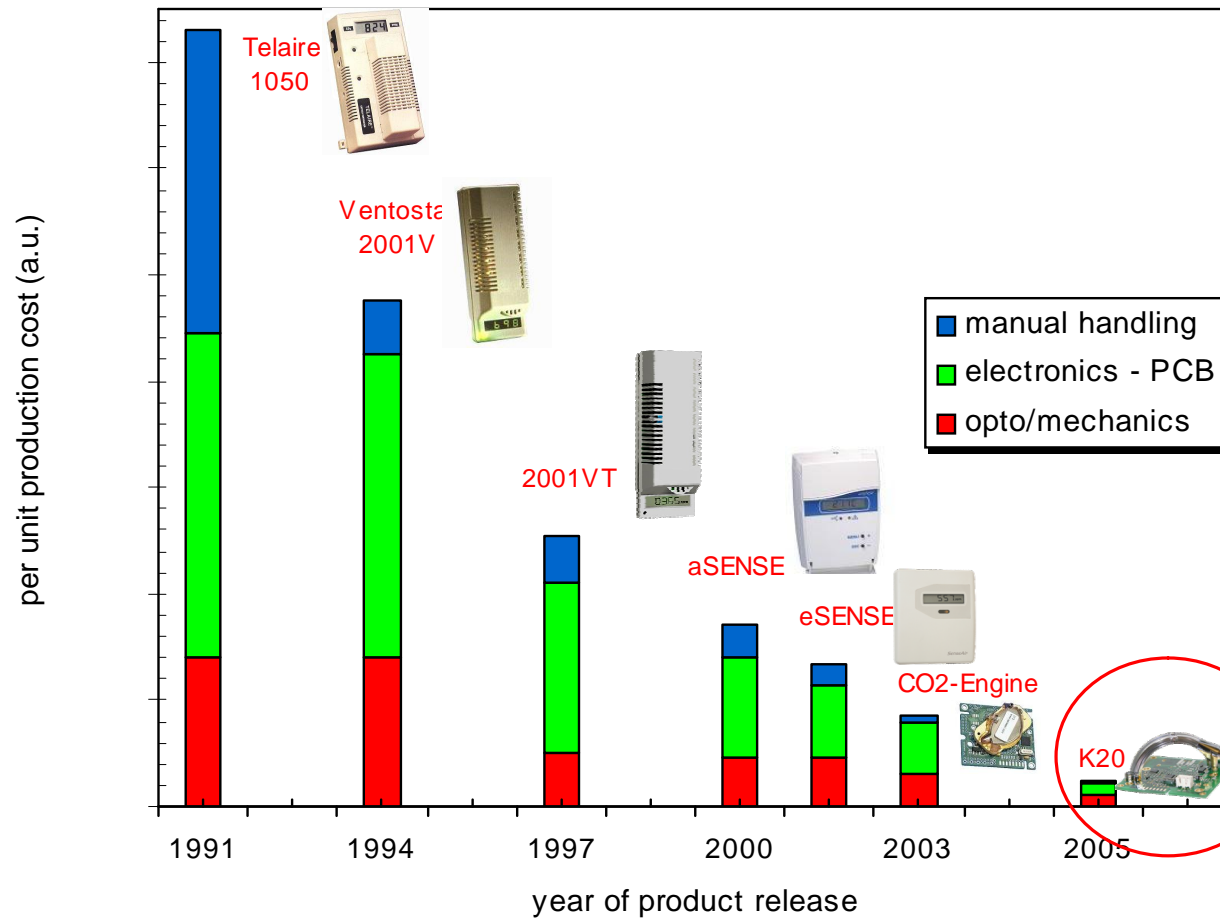
Factory mounted CO<sub>2</sub> sensor building components is one key for making a safe and energy efficient indoor environment available for everyone.



## SenseAir IR gas sensor technology production cost evolution



## SenseAir IR gas sensor technology production cost evolution



# Automotive CO<sub>2</sub> sensor

www.airrex.co.kr

## Vehicle Air Quality Monitor

CO<sub>2</sub> Monitor by NDIR sensor | Built-in Air Quality Sensor | Air Ion Generator



**Introduced at the Las Vegas Automobile Accessory Fair, Nov.1-4, 2005**



### General Features

1. World first VAQ (Vehicle Air Quality) monitor
2. Detecting CO<sub>2</sub> level by NDIR (Non Dispersive Infrared)
3. Indicating air quality by 3 color LED for 'GOOD', 'FAIR', 'BAD'
4. CO<sub>2</sub> level warning by buzzer and red lamp
5. Helpful to driver's awareness against sleep
6. Large amount of anion generating without power
7. Safe & comfortable

AA-950-BLUE

POWER ION

**AIRREX**  
ION & OXYGEN AIR PURIFIER

CO<sub>2</sub> 1850 PPM

ION

AIR STATE

GOOD

VEHICLE AIR QUALITY MONITOR

AA-950 BLACK

CO<sub>2</sub>Engine-LO

**HEPHZIBAH CO.,LTD.**

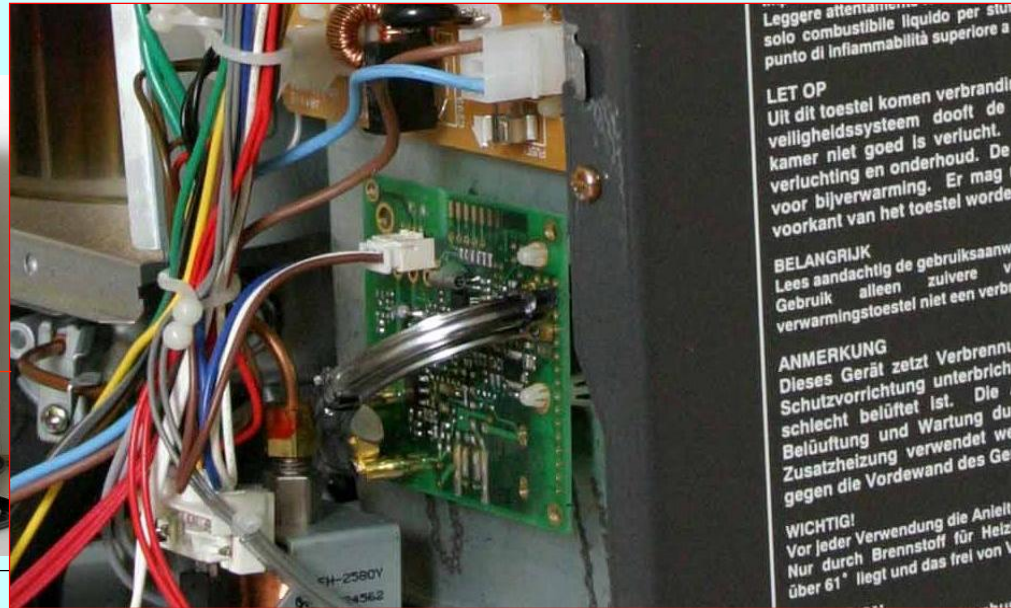
423-5 Chungchun2-dong, Bupyeong-gu, Incheon, 403-032, Korea Tel +82-32-609-5833 Fax +82-32-602-5519 E-mail sales@hdbk.com

**SenseAir**

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# Consumer products

## Kerosene Heaters...



*SenseAir at MONTIE, 2005-11-25*

# Consumer CO<sub>2</sub> sensor products

Kitchen appliances...



Automatic baking & intelligent cooking control

# Consumer CO<sub>2</sub> sensor products

Home appliances...

## Green System



**Central Vacuum Cleaner with  
DCV Fresh air supply**

### System feature

- Both Vacuum Cleaning and Fresh Air Supplying are available in one unit.
- Requires minimum space for installation
- Supply fresh air by Carbon + HEPA Filter
- Air Supplying pipe cleaning available by Vacuum cleaner
- Minimized noise with damper and Grill chamber



**Toothbrush Sterilizer + Air Purifier**

# *SenseAir factory*

overview...

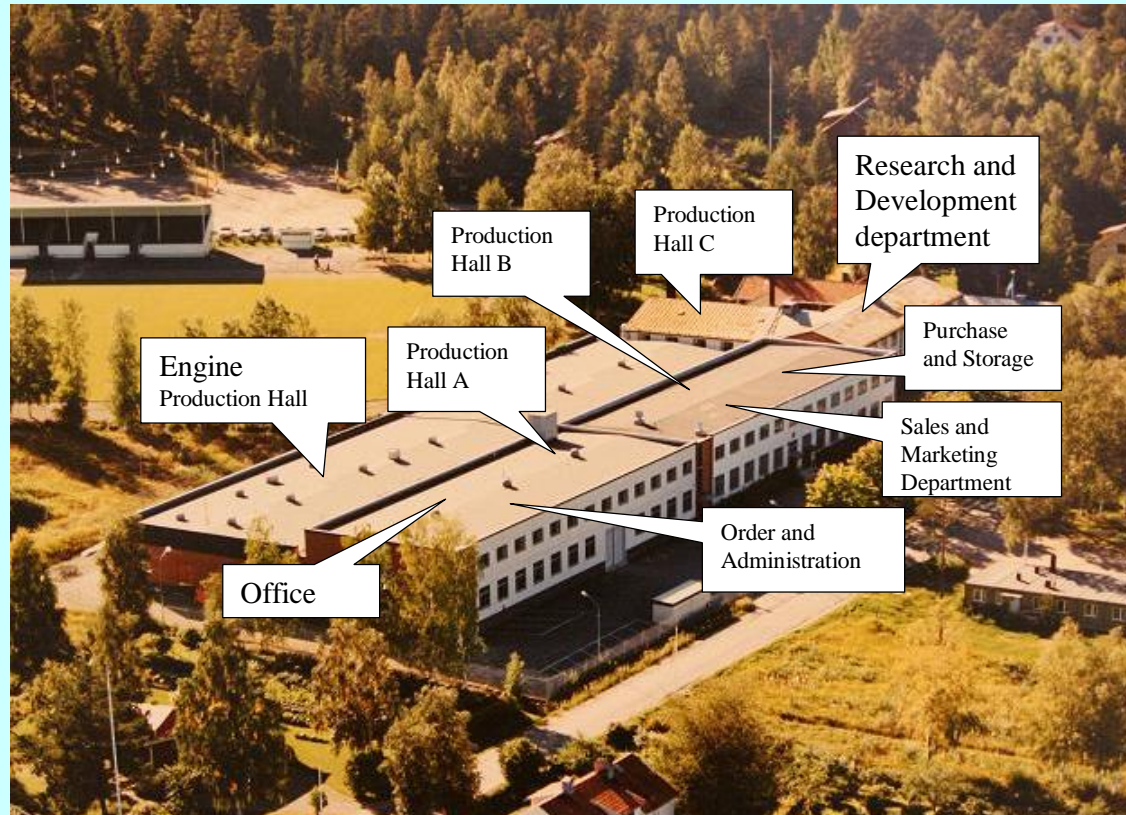


*SenseAir at MONTIE, 2005-11-25*



# SenseAir factory

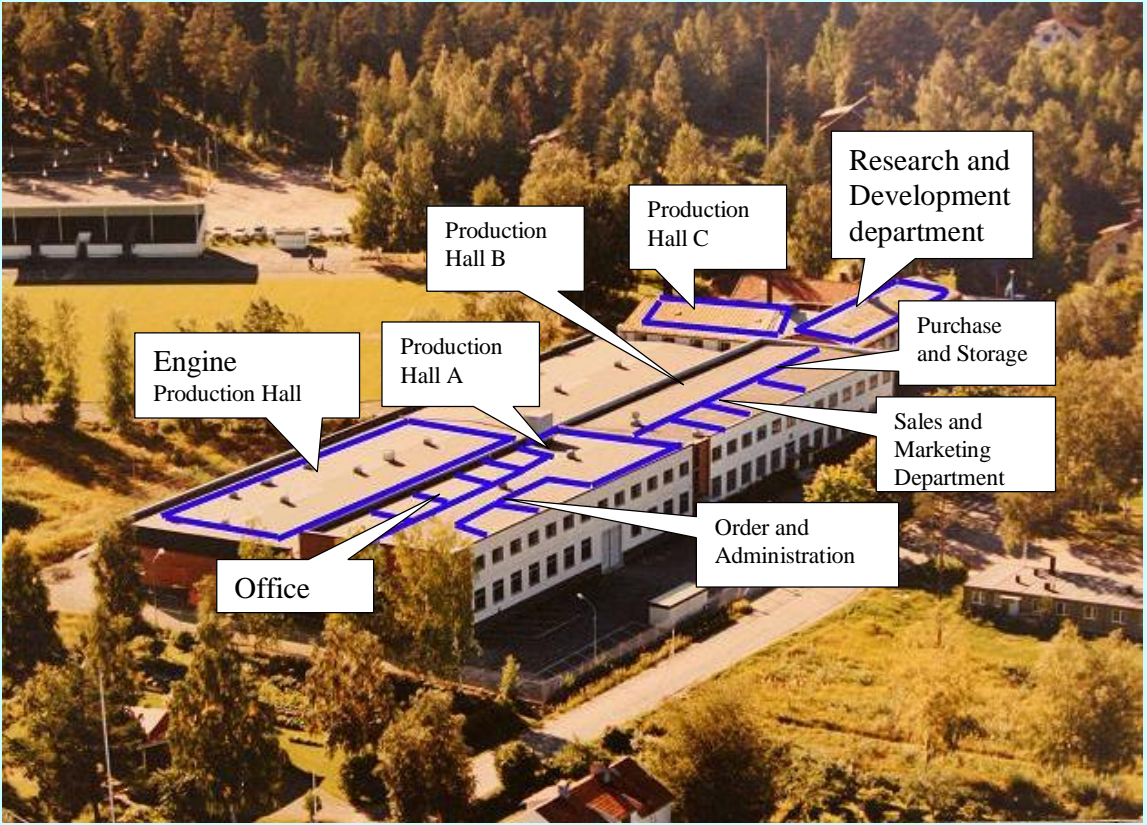
overview...



*SenseAir at MONTIE, 2005-11-25*

# SenseAir factory

overview...



# SenseAir factory

CO<sub>2</sub> ENGINE production line...



*SenseAir at MONTIE, 2005-11-25*

# SenseAir factory

## CO<sub>2</sub> ENGINE production line...



**CAPACITY:**

~ 8400 sensors/day

*SenseAir at MONTIE, 2005-11-25*

# SenseAir AB

final remark...

High performance low-cost CO<sub>2</sub> sensors are available today for built-in applications!

**Your future depends on you!**

