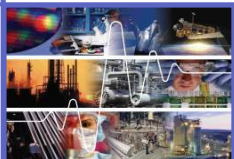




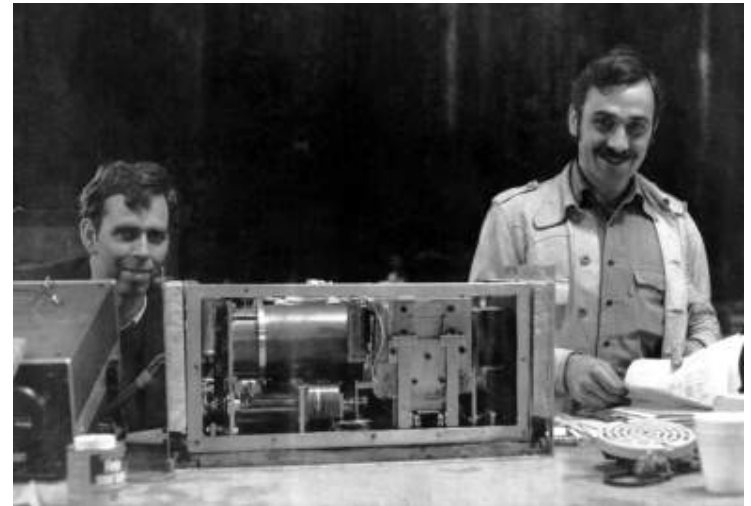
ABB
Analytical Business Unit
Quebec-City

CANADA



Our History

- **1973:** Bomem inc. was born.
- **1988:** Bomem inc. becomes public.
- **1990:** Hartman & Braun acquires Bomem
- **1996:** Elsig Bailey acquires Hartman & Braun including Bomem inc.
- **1999:** ABB acquires Elsig Bailey including Bomem inc.
- **2002:** ABB Bomem inc. unit becomes part of Analytical & Advanced Solutions BU
- **2007:** Introduction of new FTIR platform the MB3000 series
- **2008:** Celebrating 35 years of innovation and excellence in spectroscopy.



Henry Buijs and Garry Vail

ABB Analytical Business Unit today

- Global product responsibility within ABB
 - Worldwide mandate for Infrared sensor technology manufacturing and sales
- Over 200 employees in Quebec City
- 2007 Revenues: ca. \$ 40 million
- More than six thousand instruments installed
- A global leader in:
 - Remote sensing, infrared technology applications for satellites
 - Space agencies and research laboratories
 - Analytical solutions for quality applications and Process Monitoring
 - Process Industries



ABB Quebec – a world leader in spectroscopy



- ABB Analytical Quebec is the preferred supplier of Research grade infrared spectroscopy measurement for the development of analysis methods both for quality laboratory and on-line applications.
- We provide laboratory, process and remote sensing measurement solutions to improve quality, productivity, safety and to better understand our atmosphere.
- ABB's advanced solutions enable our clients to use less energy and fewer resources, thereby lowering the environmental impact of their operations.



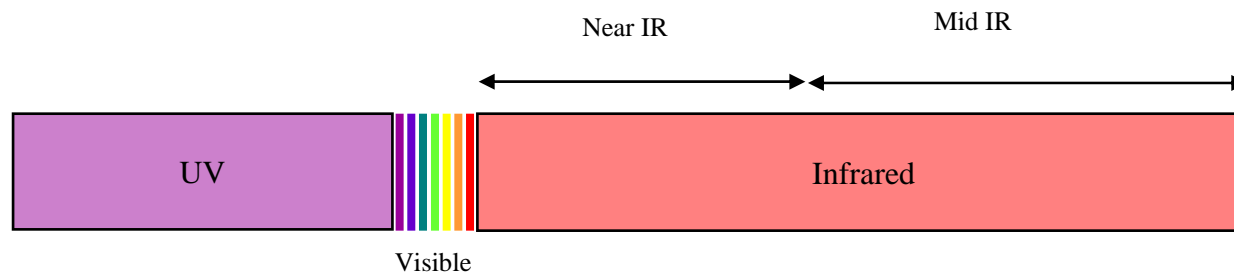
Our main focus is “Infrared Spectroscopy”

■ Spectroscopy

- The determination of the relative intensity of different wavelengths of light
 - In the visible the relative intensities of colors

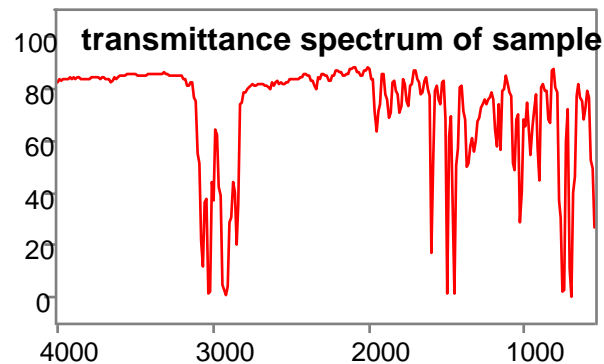
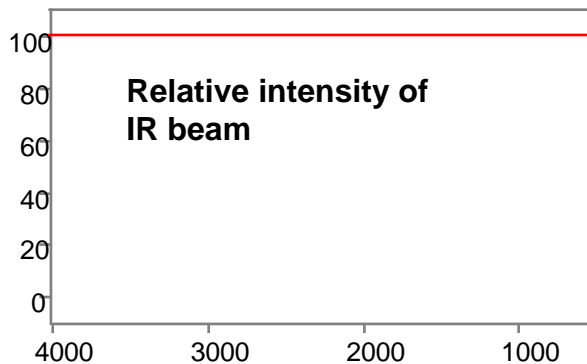
■ Why Infrared?

- In the (Mid) infrared part of the electromagnetic spectrum intensity differences identify different molecules



Infrared Spectroscopy, How is it done?

- Shine infrared light on a material
 - Start with uniform intensity
- View how the uniform intensity has changed
 - The change is called the “transmittance” of the material

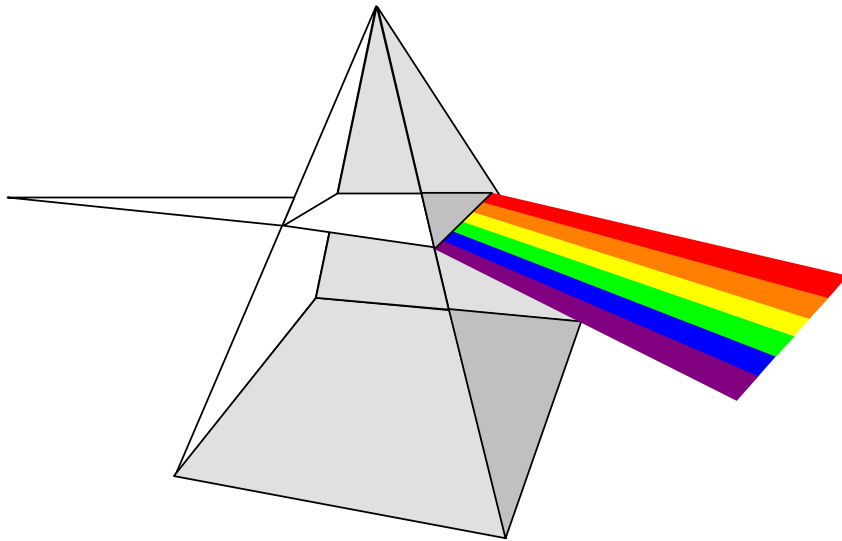


Infrared Spectroscopy, How is it done?

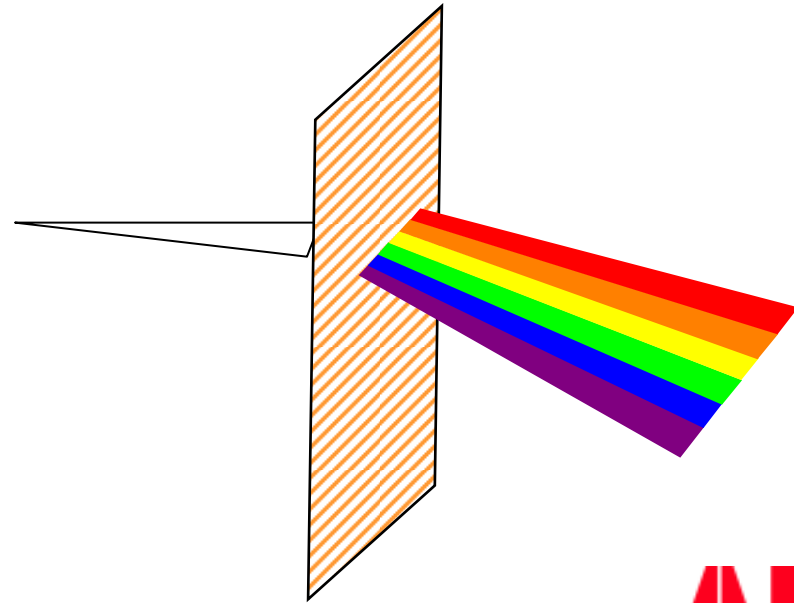
- The Infrared spectrometer
 - Classical approach
 - Separate wavelengths with a glass prism

Or

- Separate wavelengths with a diffraction grating



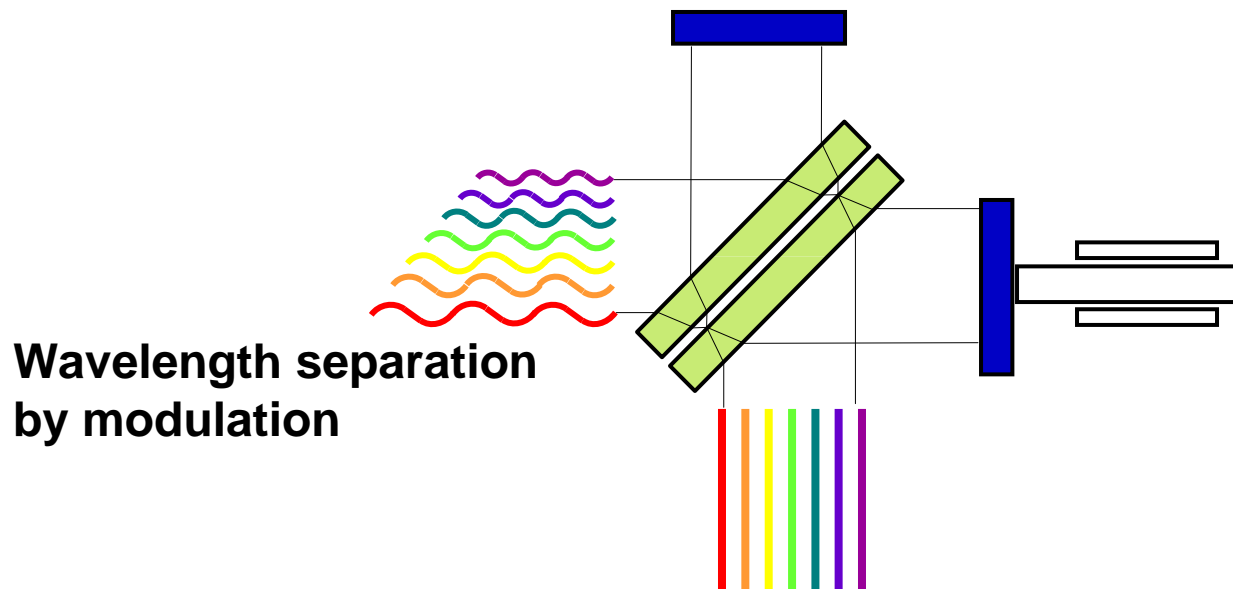
Prism



Diffraction grating

Infrared Spectroscopy, How is it done?

- The Infrared spectrometer
 - Modern ABB approach
- The Michelson Interferometer
 - Optical part of FT-IR
- **ABB is a world leader in the design, manufacture and application of Michelson Interferometer based FTIR spectrometers**



Infrared Spectroscopy, Summary

- Infrared Spectroscopy can distinguish over 200,000 chemical products
 - By non-destructive measurement
- **ABB is a world leader in the quantitative determination of chemical composition**
 - By Infrared spectroscopy
 - Using computer assisted multivariate analysis techniques
- **ABB FTIR spectrometers are used in**
 - Analytical laboratories
 - For product quality assurance
 - Process environment
 - For continuous process monitoring
 - Remote sensing
 - For atmospheric monitoring
 - From the ground
 - Aircraft and high altitude balloons
 - Satellite



Our Markets

- HPI (Hydrocarbon Processing Industries)
- Chemicals
- Pharmaceuticals
- Semiconductors
- Academic (Universities, Colleges, Research Centers)
- OEM (Original Equipment Manufacturers)
- Metallurgy
- Remote Sensing



Key application: remote sensing

Atmospheric and Environmental

- Atmospheric research
- Pollution monitoring
- Weather forecasting
- Climatology

Gas Detection (Fugitive Emission, Chemical Agents...)

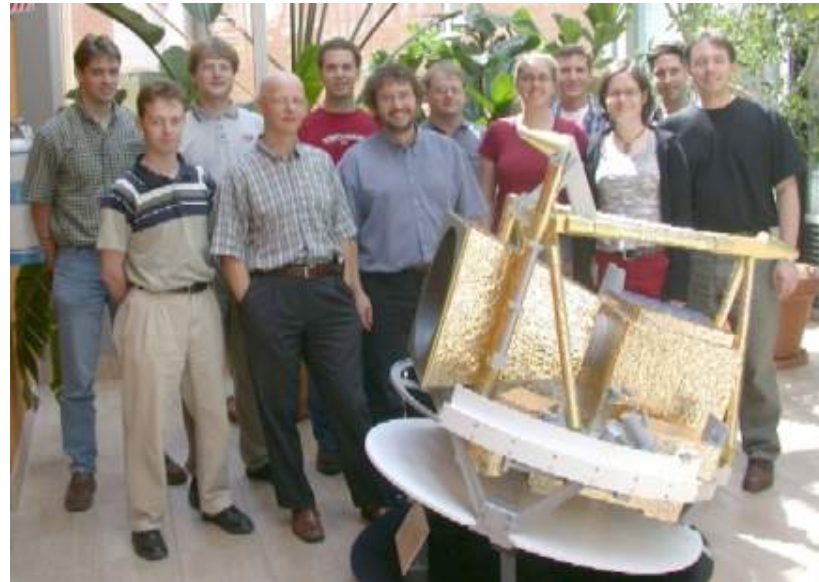
- Environmental protection
- Civil protection

Solutions for ground-based, airborne and space applications



Our team

- Our business is mainly (>90%) international: USA, Europe, Asia
- Space business operations being expended in Switzerland
- Remote sensing-related experienced staff ~ 100 employees
 - Management
 - System
 - Optics
 - Mechanics
 - Electronics
 - Software
 - Manufacturing
 - Procurement
 - Quality Assurance



Simulating space conditions in Quebec

- Clean rooms & laboratories
- ESD Stations
- Vacuum and thermal chambers
 - Very cold temperature
 - minus 200 Celsius
 - Very hot temperature
 - almost as hot as the sun surface
- Vibration Tests
- Optical Tests
- Environmental Room
- High Safety Beryllium Station
 - Meet the highest industry standards

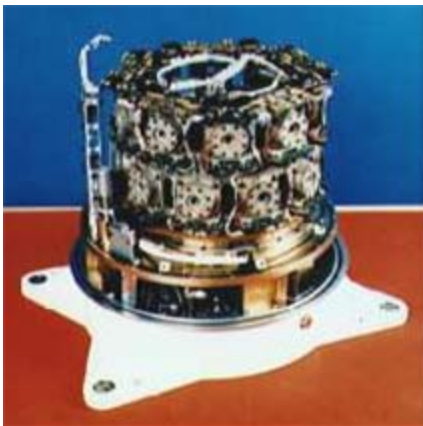


POLYM: first ABB Analytical project in space

POLYmer Morphology Experiment

Application: micro-gravity studies

- In 1988, ABB Analytical supplied an interferometer subsystem to 3M for the Space Shuttle instrument POLYM.
- The instrument flew and operated successfully as part of STS-34 in October 1989, together with the Galileo interplanetary probe.



Improve Weather Forecasting

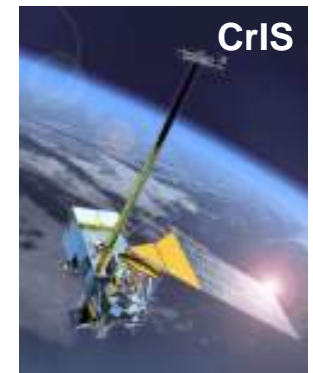
We depend on the quality of weather prediction to take the right decision at the right time

ABB can contribute to:

- Save human lives
- Reduce economic costs
- Better protection of industrial operations

Simply by:

- bringing better monitoring and tracking hurricanes
- predicting severe storms



ABB

CrIS/NPOESS

Cross-track Infrared Sounder

Application: weather forecasting

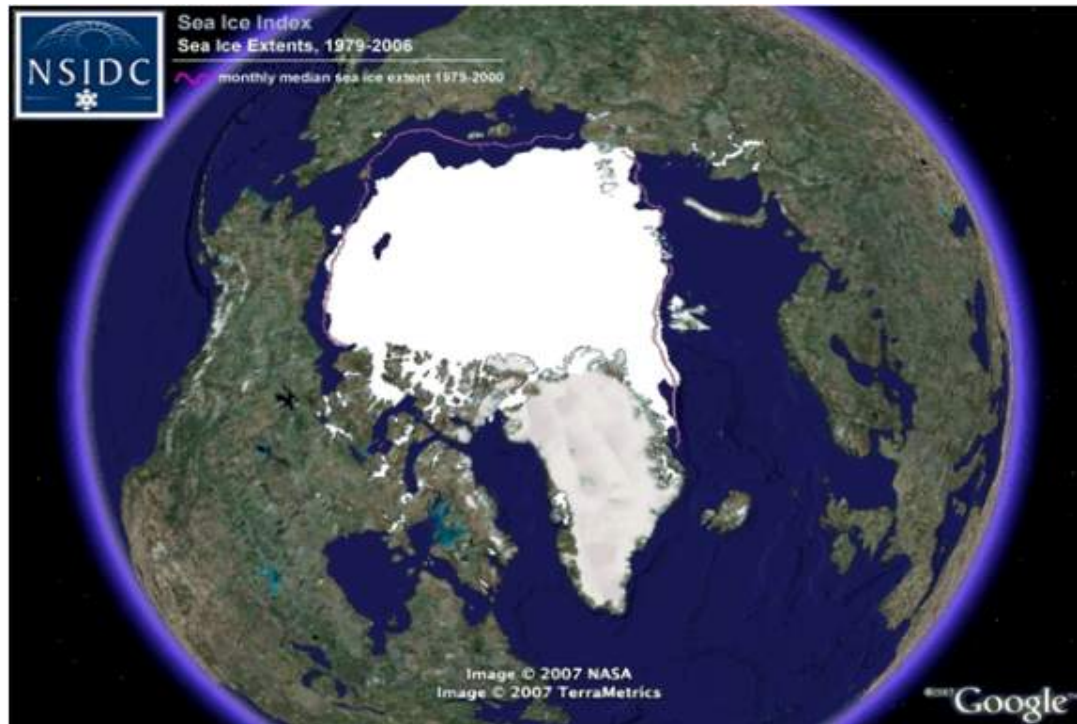
- This Fourier-Transform Spectrometer is a key instrument of NPOESS, the next generation of US polar-orbiting **weather** satellites.
- CrIS will measure the vertical profile of temperature, pressure and humidity in the atmosphere.
- ABB is responsible for the design and manufacturing of the interferometer, the on-board calibration source, and the definition of the calibration algorithms.
- ABB has been working on this program with ITT Aerospace for the last 10 years.
- **Flight-Model #1 was delivered in November 2005. FM-2 manufacturing is on-going.**



ABB

Climate change monitoring

- ABB supports Kyoto Protocol to reduce greenhouse gases emissions
- Monitoring atmospheric constituents for climate change (greenhouse gases)
- Monitoring land, ocean, and space



First satellite to monitor greenhouse gas emissions

Greenhouse gases Observing SATellite

Application: greenhouse gases measurement

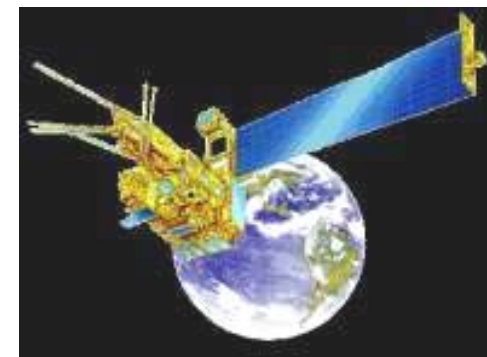
- The GOSAT main component is a Fourier Transform Spectrometer optimized for the measurement of greenhouse gases.
- Collect and transmit precise measurements of the atmosphere's CO₂ and methane levels at 56,000 observation points from 700 kilometers above the earth.
- Launch planned for early 2009.



Protection of ozone layer

ABB's solutions are used for ozone chemistry and atmospheric research

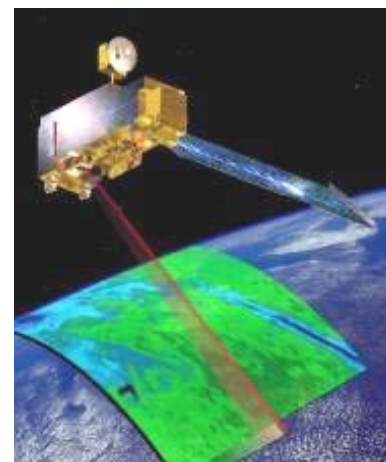
- Increase our understanding of the dynamics of ozone
- Help scientists and policy makers to assess existing environmental policy
- Data to develop protective measures for improving the health of our atmosphere and preventing further ozone depletion.
- Data to identify how the ozone layer can be restored and preserved



Pollution and environmental monitoring

ABB's technologies serves to :

- Assist scientists and policy makers to assess existing environmental policy
- Better monitoring of pollution results in developing protective measures for improving the health of the atmosphere and preventing further ozone depletion
- Detect toxic gases to public improve safety
- Enhance our knowledge of the lower atmosphere and to particularly observe how it interacts with the land and ocean biospheres.



ACE-FTS/SciSat-1

Atmospheric Chemistry Experiment

Application: ozone and atmospheric research

- ABB was the prime contractor of ACE-FTS, the main instrument of the Canadian Space Agency's satellite SciSat-1.
- ACE/SciSat-1 was successfully launched by NASA on August 12, 2003 and delivers excellent results.



- ACE measures by solar occultation the concentration of up to 40 gases in the atmosphere, including ozone and CFC's.
- ACE is a high spectral resolution spectrometer (0.02 cm^{-1}) with very high sensitivity and spectral coverage.
 - Example: ACE observed traces of Phosgene, a highly toxic gas, in the stratosphere. The concentration measured is around 10 parts per trillion.

MIPAS/Envisat

Michelson Interferometer for Passive Atmospheric Sounding

Application: atmospheric chemistry

- High spectral resolution Michelson interferometer (0.025 cm^{-1}).
- Launched in 2002 by Ariane 5 on the European platform ENVISAT-1
- ABB has been involved in MIPAS for the past 15 years
 - Ground support test equipment
 - Engineering support
 - Optical alignment
 - Calibration algorithms
 - Performance models
 - Simulation.



ENVISAT structural model for qualification in vibration

Customers

Through the years, we developed & maintained fruitful relations with key organizations involved in the remote sensing industry.



Revolutionizing the way pharmaceuticals are made

- The global pharmaceuticals industry needs to ensure all pharma products are of consistent and repeatable quality.
 - Requiring Continuous online analysis of the manufacturing process.
- Integration of infrared spectrometer technology and various process analytical devices with ABB's 800xA process control platform
 - Guarantee consistent product quality
 - Increases availability by as much as 40 percent and reduces costs by up to 30 percent.



ABB

Pharmaceutical Industry

■ Raw Material ID

- For use at receiving docks and for dispensing confirmation (all incoming raw materials, excipient and active)



Raw Material probe

■ Dryer Monitoring

- On-line or at-line measurement, remote sampling



Dryer

■ Solvent Recovery

- On-line or at-line measurement, fast (< 2 minutes), remote sampling, multi-point



Solvent Recovery

■ Tablets Content Uniformity

- Diffuse transmission measurement (Less sensitive to product uniformity), Tablets, caplets, capsules, gel tabs, coated and uncoated samples



Tablet Sampler

■ Blend Uniformity

- Quantitative analysis of actives and excipients in less than 2 minutes, disposable vial sampling, rotating sampling mechanism



Blend uniformity



Lower costs and improved environmental impact

- **Typically refineries put more octane into their products than is necessary to guarantee octane levels**
 - A refinery that produces 95.01 octane instead of 95 octane for “Super” petrol can save \$6.7 million a year on a production capacity of 200,000 barrels a day.
- **ABB FTIR analyzers significantly reduce the excess octane**
 - Tracking gasoline properties precisely during blending to within 0.02 to 0.05 of the correct pump octane,
 - Minimizing the octane giveaway and lowering costs
- ‘Real time’ corrective action and early detection of impurities



ABB

Chemicals

- Oleochemical or Oil & Fat Analyzer
 - At-line analysis of the Iodine Value and % Trans parameters
 - Pre-calibrated for Iodine values (IV) and % Trans
 - AOCS Standard procedure for Iodine Value
- Analysis of Polyols
 - At-line analysis of the OH value in Polyols



Oils and Fats contained in the Global IV Calibration

Canola	Palm Kernel	Vegetable Blends
Coconut	Palm Olein	Beef Tallow
Cottonseed	Palm Stearin	Fish
Soybean	Linseed	
Crude Vegetable	Sunflower	

Low-cost, high-performance analytics

- Latest analytics innovation MB 3000 launched in 2007
- Major technological breakthrough for compact low-cost, high-performance analytic equipment
- Based on space technology interferometer



■ Features

- Logical and intuitive command system to analyze properties of compounds and complex mixtures
 - from the sugar content of food and drink to the chemical composition of forensic and toxicology samples.

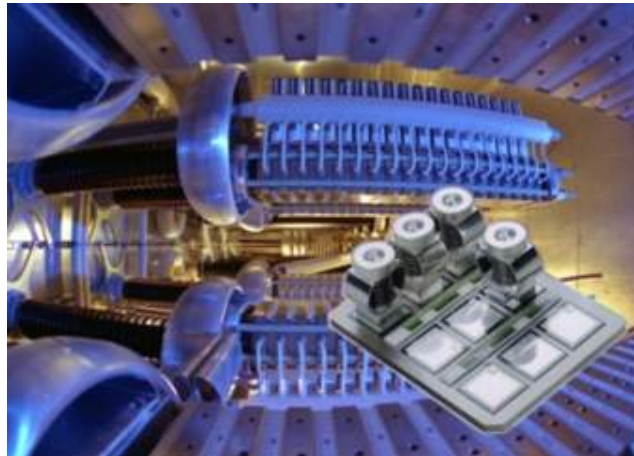
■ Benefits

- Most reliable FTIR system in the market
- Lowest cost of ownership
- Easy to use and maintenance free
- A unique lifetime warranty against deterioration of optical components
- No components to replace or adjust.



Cutting semiconductor chemical consumption by up to 30 percent

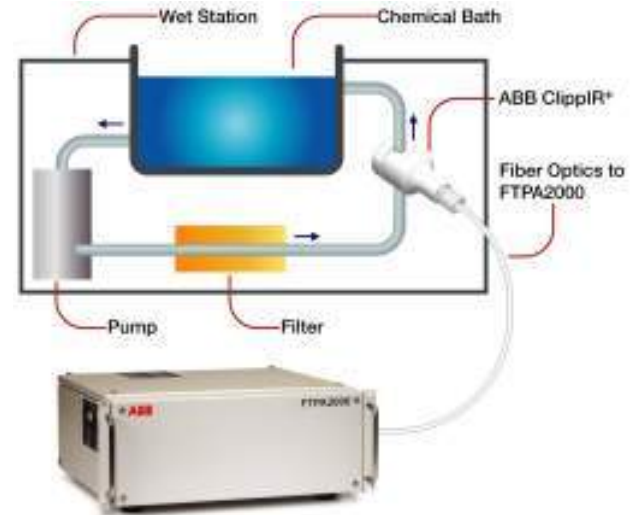
- ABB's Wet Process Analyzer reduces chemical consumption by up to 30 percent in the semiconductor manufacturing process.
- Based on patented ABB technology the analyzer continuously monitors chemical concentration in a wide range of etching, cleaning and stripping fluids that are used in the wafer cleaning process.
- The device improves process control, increases throughput and extends the lifetime of chemicals from a few hours to several days.



Semiconductors

Based on Interferometer technology

- Wet Process Analyzer (WPA)
 - Non-intrusive analysis of the chemical composition of liquids used in semiconductor manufacturing processes



Semitool's Radar Tool Platform

- ABB brings Real Time process monitoring
- Reducing Chemical Cost reduces Chemical Waste through Chemical lifetime extension.



Analyzing from catalyst to milk quality

Based on Interferometer technology

- Gas Analyzers for automotive catalyst testing
 - ABB Germany supplies test authorities such as TÜV, Dekra and catalyst producers to analyze car exhaust gases
- Gas Analyzers for waste incinerator emission monitoring
 - ABB Germany is the market leader for emission monitoring in incinerator stacks
- Other applications: milk analysis for Diaries, for ambient gas analysis, others.
- More than 1000 sold



ACF-NT

Metallurgy Industry

- ABB is #1 in the world for inclusion and hydrogen measurement in liquid Aluminum
- Sold in 45 countries to all major Aluminum producers
- Developed in collaboration with Alcan R&D and manufactured under license from Alcan



ABB

Metallurgy Products

- Complete range of analytical solutions to the aluminum industry:
 - AISCAN hydrogen analyzer,
 - Reliable quantitative technique to directly monitor the dissolved hydrogen content in molten aluminum. fast, accurate over a broad measurement range and offers outstanding reproducibility. More than 400 units sold worldwide
 - LiMCA CM inclusion analyzer,
 - Liquid Metal Cleanliness Analyzer. The LiMCA CM system provides granulometric and total density information on the inclusion content of aluminum melts, in real time
 - Prefil[®]-Footprinter melt cleanliness analyzer
 - PoDFA inclusion identification and quantification analysis



AISCAN C



Prefil[®]



LiMCA CM



PoDFA



Power and productivity
for a better world™

