

# DTSC Green Chemistry Symposium III Benign by Design Session October 30, 2007

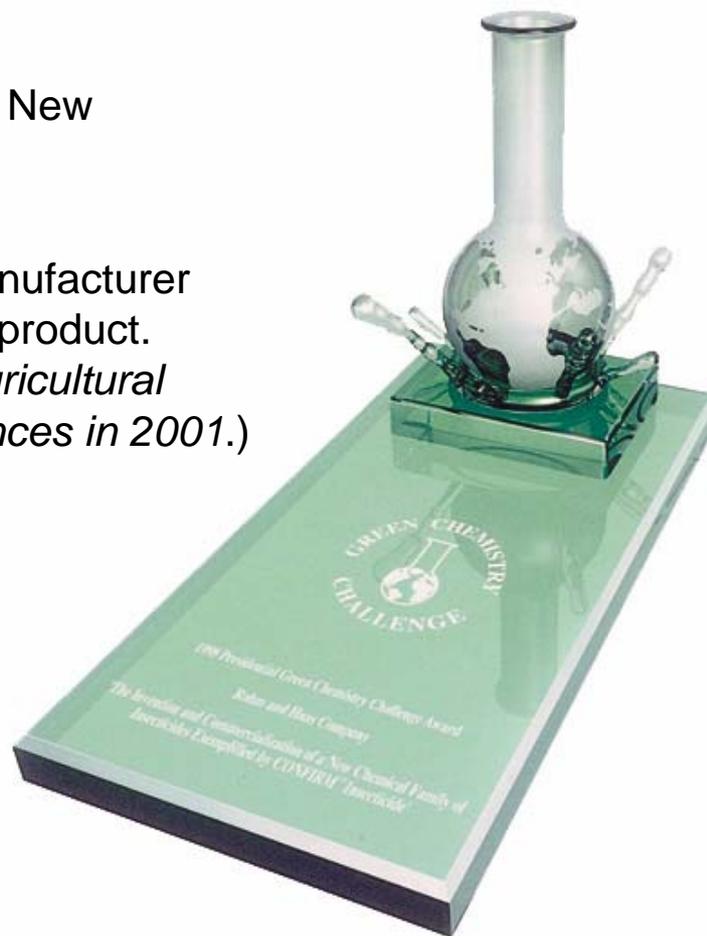
Michelle Smith

# Background

- **The company will celebrate 100<sup>th</sup> anniversary in 2009**
- **Listed on NYSE in 1949 – ROH**
- **Sales ~ \$8.2 billion**
- **Employees ~ 15,800**
- **100 manufacturing sites**
- **33 technical centers**
- **27 countries**
- **Headquarters in Philadelphia, PA**
- **Businesses:**
  - Electronic Materials (circuit board technologies, semi-conductor technologies, packaging/finishing technologies)
  - Performance Materials (process chemicals and biocides)
  - Paint and Coatings Materials
  - Packaging and Building Materials
  - Primary Materials
  - Salt

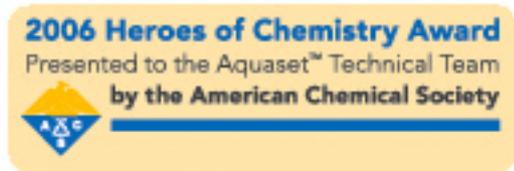
# Green Chemistry Awards

- **US Presidential Green Chemistry Challenge**
  - 1996: Designing Safer Chemicals Award
    - **Sea Nine™** Biocide
  - 1998: Invention and Commercialization of a New Chemicals Family of Insecticides
    - **CONFIRM™** Insecticide.
    - our company was the first chemical manufacturer to receive the award for an agricultural product. (*Rohm and Haas Company sold the Agricultural Chemicals business to Dow Agro-Sciences in 2001.*)



# More recently...

- Awarded to our 8 research scientists and managers



## Heroes of Chemistry



- **American Chemical Society**
  - 2006: Heroes of Chemistry Award
    - Aquaset™ acrylic thermosetting binders



# Prix Pierre Potier

## Innovation in the Environment Medal

- **From French Ministry of Industry**
  - This was the first time that the award was given in recognition for innovation that had a positive effect on the environment
- **Avanse™ resins new acrylic polymer platform**
  - May extend the life of the paint job
  - Improved adhesion to metal and other substrates
  - More efficient interaction between paint ingredients requires less polymer and pigments and therefore less energy to make them

# Sea Nine™

## 4,5-dichloro-2-n-octyl-4-isothiazolin-3-one

- **Attributes**

- No heavy metals
- Reduces drag due to growth build up on ship's surface
- Conserves fuel and reduces emissions

- **Markets**

- Marine anti-foulants
- Paint film (in container and on surface)
- Paper industry (wet pulp)

# Which of the 12 Principles are supported by each product ?

- **Sea Nine™ Biocide**

- 1 prevent waste (of final product)
- 3 less hazardous synthesis
- 4 design safer chemicals
- 6 design for energy efficiency (of final product)
- 8 reduce derivatives
- 10 design for degradation

# Example of fouling:



# CONFIRM™ Insecticide

## Tebufenozide mimics 20-hydroxy ecdysone: triggers molting

- **Attributes**

- 20-hydroxy ecdysone neither occurs nor has any biological function in most non-target organisms; safer for mammals, birds, plants and aquatic organisms
- Also safe to key beneficial, predatory and parasitic insects and arthropods
- Will not create secondary outbreak of pest due to destruction of natural predators
- Low use rate
- Poses no significant hazard to applicator or food chain
- Non-oncogenic, non-mutagenic, and without adverse reproductive effects
- Biodegradable, breaking down into carbon dioxide and water

# **CONFIRM™ Insecticide**

**(and related insect control agents Mach2™ and Intrepid™)**

- **Markets**

- Fruit
  - Caterpillars including Codling Moth
- Cotton
  - Armyworm Complex
- Forests
  - Gypsy Moth
- Turf
  - Japanese Beetle Grubs

- **Intellectual Property Owners named Dr. Hsu and Dr. Aller Inventors of the Year in 1995**

# Which of the 12 Principles are supported by each product ?

- **CONFIRM™ Insecticide**  
(and related insect control agents Mach2™ and Intrepid™)
  - 1 prevent waste
  - 2 atom economy
  - 3 less hazardous synthesis
  - 4 design safer chemicals
  - 10 design for degradation

# Aquaset™ binders

- **Attributes**
  - No unwanted byproducts:
    - phenol
    - methanol
    - ammonia
    - formaldehyde
  - Superior shelf life
  - Non-flammable
  - Recyclable
- **Markets**
  - Fiber glass insulation

# Which of the 12 Principles are supported by each product ?

- **Aquaset™ binders**
  - 1 prevent waste
  - 2 atom economy
  - 3 less hazardous synthesis
  - 4 design safer chemicals
  - 9 catalytic reagents are superior to stoichiometric

# Avanse™ resins

- **Attributes**
  - Low VOC
  - Low odor
  - Waterborne acrylic
  - Improved pigment distribution
  - High performance
    - Gloss
    - Corrosion control
    - Hiding
- **Markets**
  - Interior wall paints
  - Exterior coatings
  - Primers
  - Top-coats
  - Direct to metal finishes

# Which of the 12 Principles are supported by each product ?

- **Avanse™ resins**

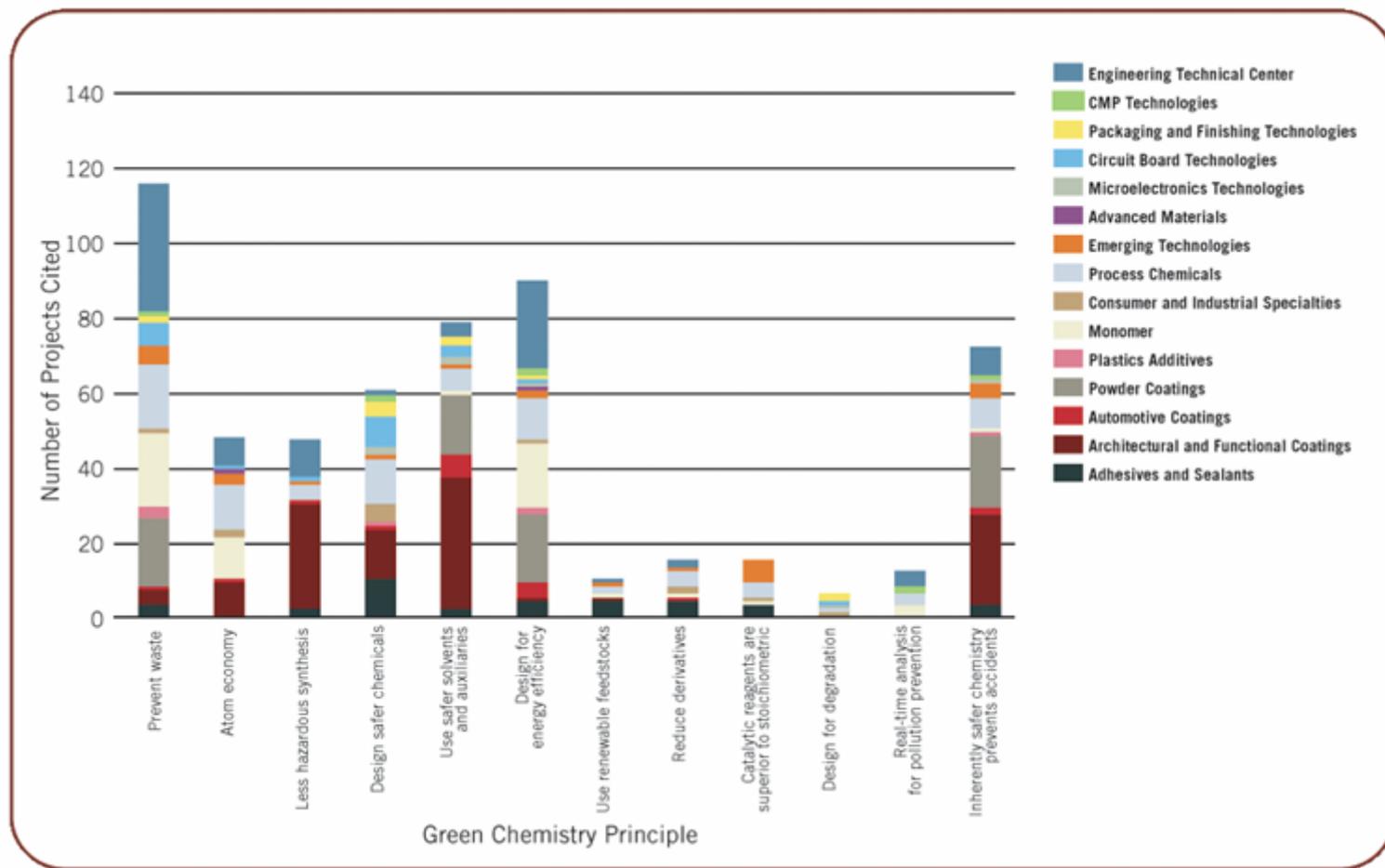
- 1 prevent waste
- 2 maximizes all materials
- 3 less hazardous synthesis
- 4 reduce toxicity
- 5 use less and safer auxiliaries
- 12 inherently safer chemistry prevents accidents

# 12 Principles Comparison

<b>SEA NINE™</b>	X		X	X		X		X		X		
<b>AVANSE™</b>	X	X	X	X	X							X
<b>CONFIRM™</b>	X	X	X	X						X		
<b>AQUASET™</b>	X	X	X	X					X			
	1	2	3	4	5	6	7	8	9	10	11	12

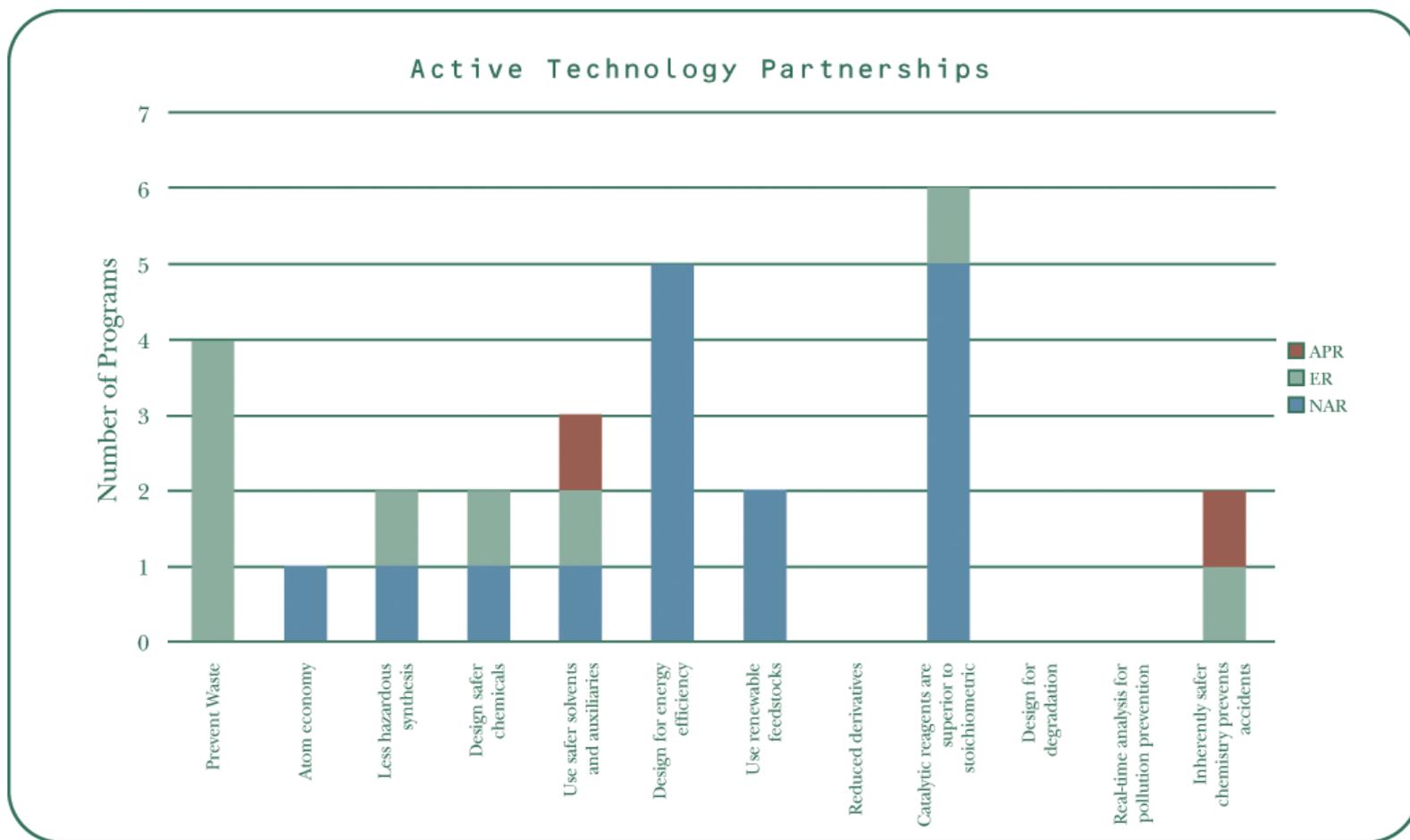
# 2003

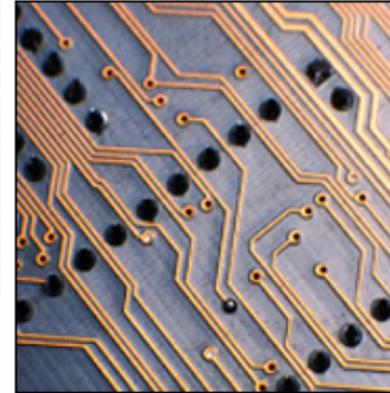
## A review of Green Chemistry Principles incorporated into current projects across the chemicals business units.



# 2004

## A review of Green Chemistry Principles incorporated into current partnerships across the chemicals business units





Thank you.