The future of our profession & How AIChE is changing to support you!

Henry T (Hank) Kohlbrand
2010 AIChE President

Introduction

AIChE

- Examining key trends and drivers helps us to prepare ourselves for the future
- Opportunities often appear at the interfaces of science and where dislocations appear
- Chemical Engineering will provide many solutions to the issues of tomorrow
- AIChE provides many resources to support members as their focus changes and the world evolves

The Profession

AIChE

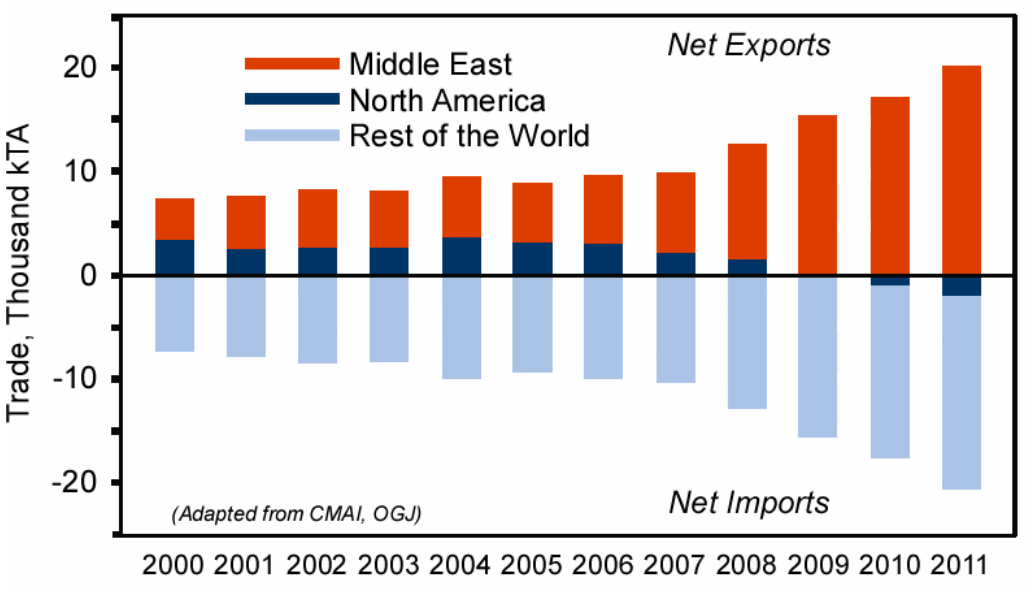
- This is a great time to be a chemical engineer
- “Traditional” roles seem to be changing, but…
- The opportunities and need for the skills brought by chemical engineers are increasing
- To be successful, we need to embrace the change and look for the opportunities and areas where our abilities can make a difference

Drivers

AIChE

- Globalizing to Globalization
  - Economic emergence of new economies
  - Movement of assets to low-cost regions
  - Political stability becomes more important
- Changing business models – companies are changing to assure future success
- Increasing interest in a sustainable future
- Energy is at the center of many discussions today
- Water will be at the center of many discussions tomorrow

Ethylene Capacity Expansions



Challenges for the next generation of change


Energy


Climate Change


Water


Health & Nutrition


Transportation & Infrastructure

- Sustainable solutions to these challenges will provide many opportunities for current and future chemical engineers
- An eye on product as well as process will provide additional opportunities
- Sustainability will provide a strong need for innovation

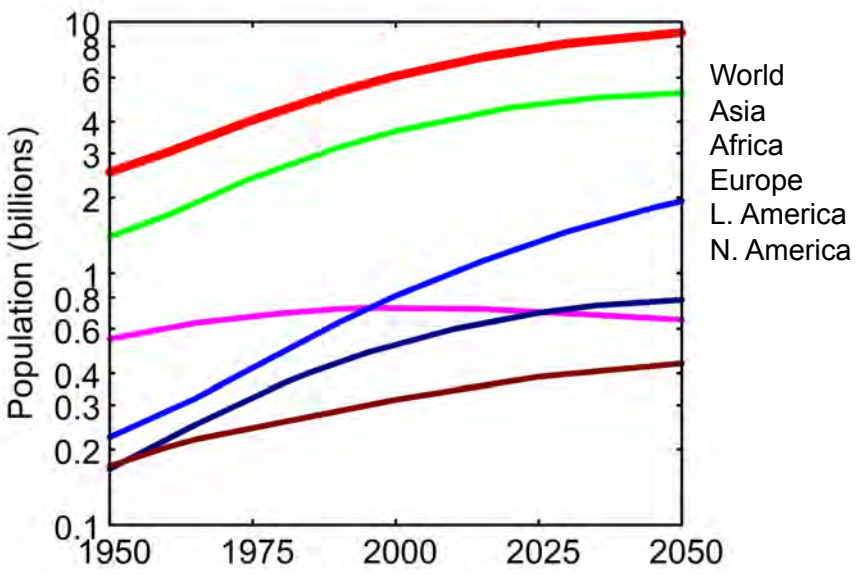
McKinsey Global Survey - Sustainability

AIChE

- *Most companies are not actively managing sustainability,*
- *Executives think it's important to a variety of corporate activities*
- More than 50 percent of executives consider sustainability "very" or "extremely" important
  - new-product development
  - reputation building
  - overall corporate strategy
- About 30 percent of executives say their companies actively seek opportunities to invest in sustainability or embed it in their business practices
- Just over 6 percent of executives say that sustainability is a top-three priority in their CEOs' agendas and actively seek to invest in it

Today's World Becoming the "Crowded Planet"

AIChE



Courtesy: John Sofranko

The "Crowded Planet" Creates Today's Grand Challenges

AIChE

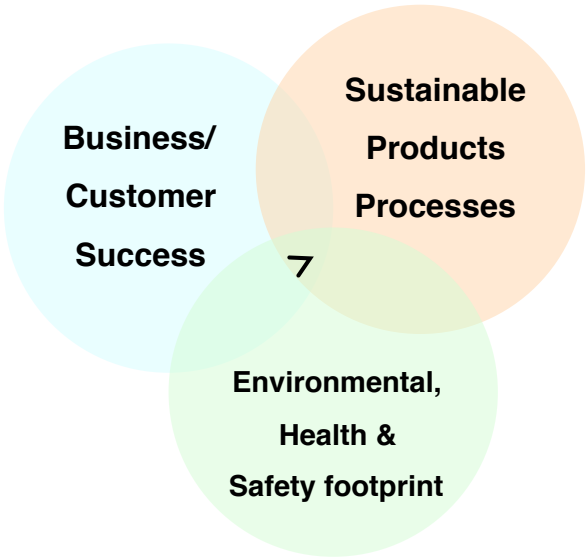
- 2.7 billion people live on less than $4/day and cannot access electricity, clean water or sanitation
- Growing demand for energy / the ways energy is used will change
- Extensive environmental threats / issue of climate change
- Inequalities of income and power (both within and between countries)
- Rapid technology diffusion – challenges of Intellectual Property protection globally

Energy, Environment, Water, & Healthcare

Courtesy: Dale Keairns

Solutions – mulitple objective functions

AIChE



Climate Change - Opportunities

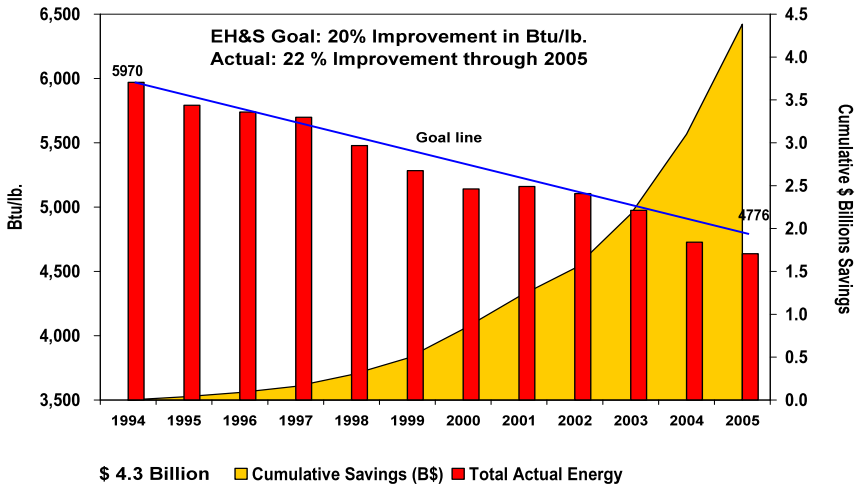
AIChE

Energy Intensity Performance Tracking

AIChE

DOW

Energy Intensity Performance



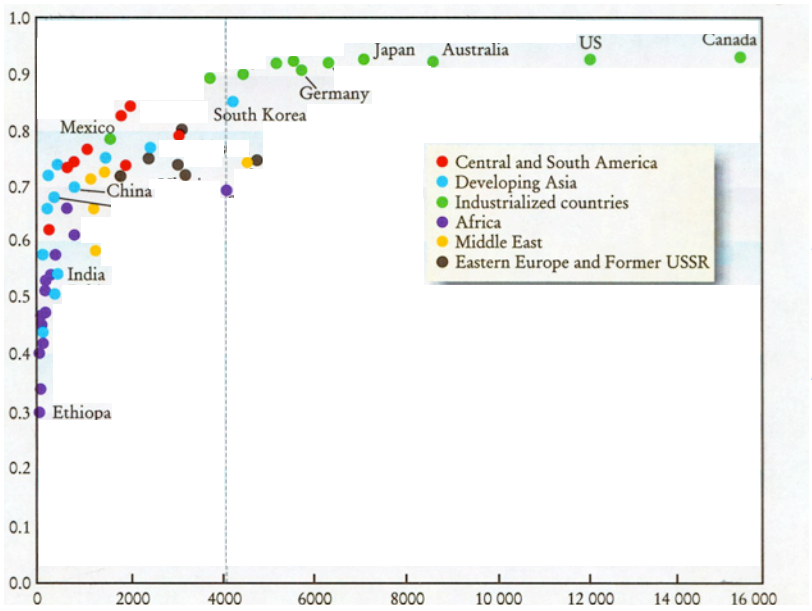
Cumulative Energy Savings = ~900 Trillion Btu's (now 1600 trillion BTU's)

Cumulative Cost Savings = >$4 Billion (now >$9 Billion)

Global Electricity Usage

AIChE

Human Development Index



Annual Per Capita Electricity Use (kWh)

Energy demand could triple by 2050

Source: United Nations

Courtesy: June Wispelwey

Fossil Fuel Reserves are Dwindling

AIChE

	Recoverable Reserves, GTC*	Reserve Life @Current Rate, Yr
Oil	120	35
Natural Gas	75	60
Coal	925	400

* Giga Tons of Carbon

Supply is not sustainable for business as usual

Source: EIA, Jeff Siirola, Eastman

The Technological Challenges

AIChE

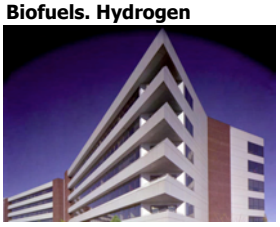
Vehicles: Efficiency, Biofuels. Hydrogen

Renewables

There is no single technological solution

Differences

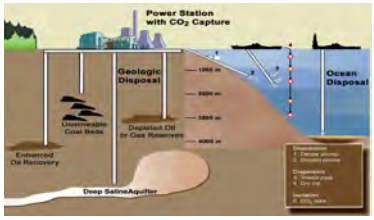
- regions
- markets
- technologies
- timing
- resources
- preferences
- needs
- infrastructures



Efficiency in the buildings and in the industry

Bio-fuels

Gen 4 Nuclear



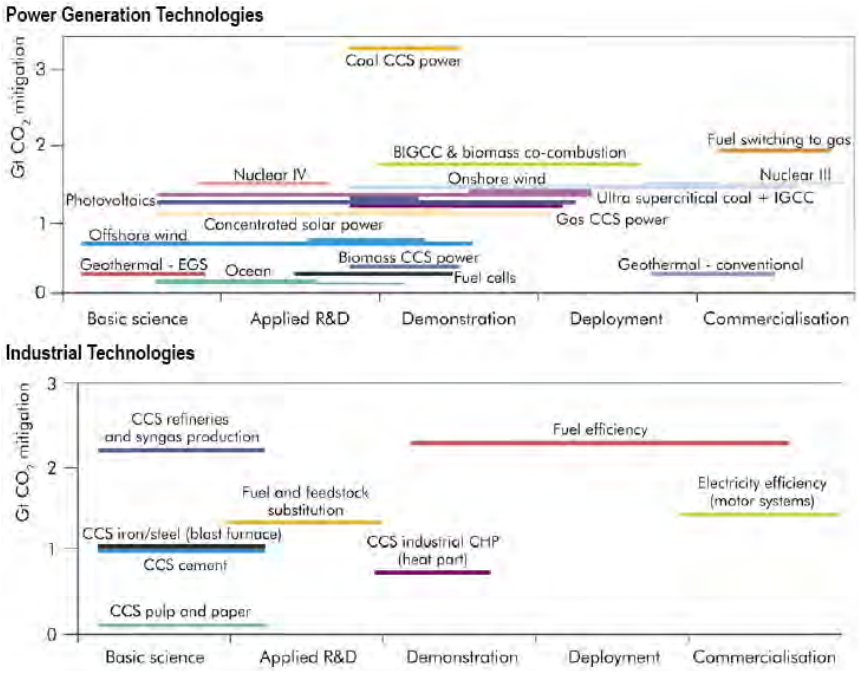
CO_2 capture and storage

Advanced power networks

Courtesy: Darlene Schuster, Founder's Societies Carbon Management

Status of Energy Technologies

AIChE



Source: International Energy Agency 2008

Water Problems

AIChE

- Access to water
  - Potable scarcity
  - Freshwater for croplands
  - Industrial water access
- Water purification and sanitation
  - Bacterial disease such as *e. coli*
  - Heavy metals such as arsenic
  - Agricultural chemicals run off
  - Pharmaceuticals and metabolites
- Water energy nexus
  - 30% of California energy use involved with purification and transportation

Today, 1 in 8 people lack safe water

Courtesy: June Wispelwey

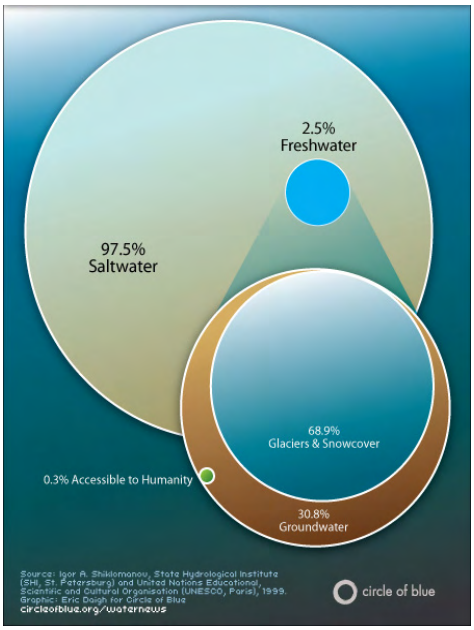
Water Scarcity for Drinking, Sanitation and Agricultural

AIChE

Average Daily Usage

USA	>100 gal
England	39 gal
Developing	<2 gal
Basic needs	13.2 gal

	Water for Production (L)
1 Apple	**700**
1 Cup Coffee	**1,120**
1 kg Chicken	**3,500-5,700**
1 kg Beef =	**15,000-70,000**
21-100 Apples	

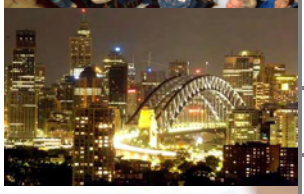


*Asian Development Bank, 2009
* Circle of Blue, USA, 2008
**The Observer*, UK, 2009

Courtesy: Scott Fogler

Water is clearly an opportunity for Chemical Engineers

AIChE

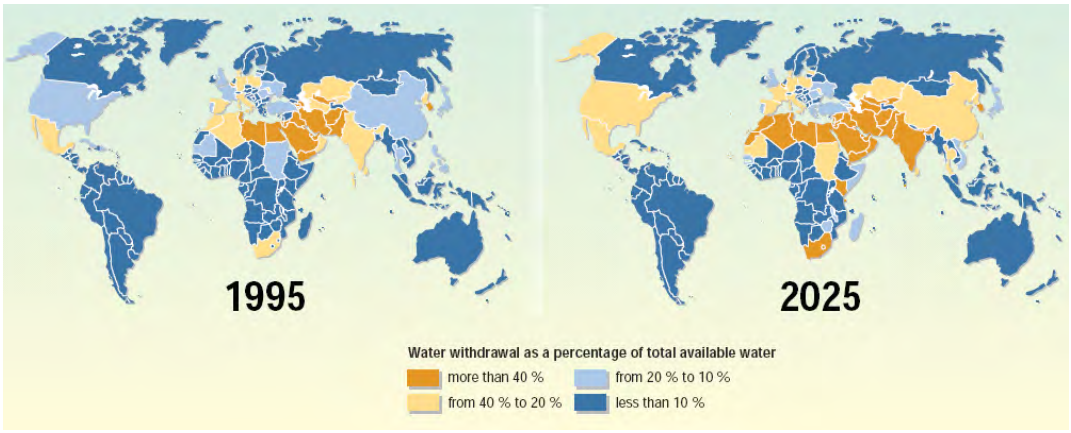


Mega Trend	Summary
Population Growth	The world population is projected to increase by one-third, to 9Bn by 2050 which presents a major challenge for existing infrastructure systems.
Urbanization	By 2030, 61% of world population will live in cities compared to 49% in 2005. Over 90% of urban population growth takes place in developing countries, mainly Asia, which requires massive new infrastructure.
Aging Infrastructure	The aging infrastructure in mature economies requires significant investments to rehab and improve.
Adoption of Safety Standards	The catastrophic consequence of infrastructure failures and public health consciousness demands stricter codes/regulations.
Efficiency Improvement	Limited resources and drives for affordability call for efficiencies in design, construction, usage, maintenance and disposal, including ENERGY.
Sustainability	Concerns on climate change will continue impact infrastructure decisions.

And a need that will rival energy in the future

Cropland Freshwater Scarcity

AIChE



Cartographer/Designer: Philippe Rekacewicz (Le Monde diplomatique), February 2006

Today
600 million people
in 21 countries

1 in 8 people
lack safe water

2025
1.8 billion people
in 36 countries

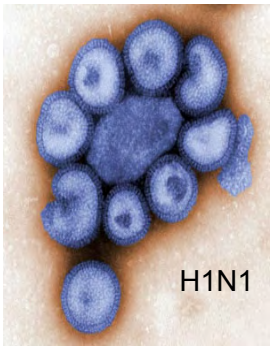
*NIC: *Global Trends*, 2008
*UNICEF/WHO: *Progress on Drinking Water and Sanitation,* 2008
*UNEP: *Global International Waters Assessment*, 2006

Healthcare Challenges Abound

AIChE

- Flu pandemics
- Growth of cancer
  - cancer is projected to become the leading cause of death worldwide in the year 2010 (American Cancer Society)
- Aids in Africa
  - 2.5 million new infections in 2007 (UN)
- Malaria still kills
  - >1 million people, 90% from Africa (CDC)
- Autoimmune diseases rising
- Growing cost of Healthcare

Pharma one of highest growth areas for Chemical Engineering employment in last 20 years

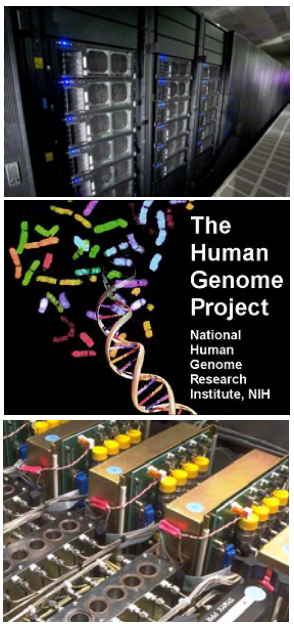


Courtesy: Scott Fogler

Change Provides Opportunity

AIChE

- Materials, products and processes
- Health, nutrition and pharma
- Approaches to energy and carbon management
- New developing areas of technology
- Some opportunities will grow faster outside of the U.S.
- Keep an eye on:
  - Fundamentals
  - Material and energy balances
  - Sustainability
- Diversify yourself!



Basic Critical Skills

AIChE

- Knowing How to Learn
  - use new information easily
- Competence
  - strong technical or operational capabilities
  - reading, writing and arithmetic
- Communication
  - listening
  - speaking
- Adaptability
  - versatility/flexibility
  - creative thinking
  - problem solving
- Personal Management
  - self esteem
  - goal setting and motivation
  - career development
- Group Effectiveness
  - interpersonal skills
  - negotiation
  - teamwork
- Influence
  - organizational effectiveness
  - leadership skills

"Industry Week", Jan 16, 1989, pp 33-34

Personal Preparation

AIChE

- Pay attention to the Basic Critical Skills
  - Special focus on learning and adaptability
- The classical employers may not be the only ones
- Prepare to work globally
  - Local environments are different
  - Culture varies
  - Schedules are 24/7
- Consider Covey's 7 Habits
- Consider re-inventing yourself and your interests every 5 years
- Remember the role that AIChE can play

AIChE

- >42,000 members from 93 countries
- Leadership Training and Ongoing Education for Professional Development
- Resources and Opportunities for Career Advancement
- Publications to keep you up to date on what is going on in the Chem-E World
- Local Meetings and National Conferences to provide Networking Opportunities
- Discounts, Insurance, and more

AIChE Mission

- To advance Chemical Engineering in theory and practice
- To maintain a high professional standard among the members, and meet the needs of chemical engineers to maintain a high level of professional competency throughout their careers
- To serve society, particularly where chemical engineering can contribute to the public interest

Strategic Plan

AIChE

- Become a Global Organization of Chemical Engineering Practitioners.
- Strengthen industry and technology groups and create new groups where needed to support the diverse interests of members.
- Aggressively develop innovative new products and services for members based on web-based technologies.
- Engage with others to improve the undergraduate curriculum in chemical engineering, and promote life-long learning.
- Impact societal issues by informing and educating the public and government in complex technical areas.

Your Life-long ChE Connection

AIChE

- ScaleUp – free student membership!
- Professional network
- Leadership training
- Ongoing education for professional development
- Resources and opportunities for career Advancement
- Publications to keep you up to date
- Local Meetings and National Conferences to provide Networking Opportunities
- IFS, CCPS, DIPPR, SBE, DIERS, NSEF, Center for Energy Initiatives, Water (soon)
- CareerToolsPLUS! (incl consulting)
- ChemE on Demand
- AIChE Smartbrief-weekly e-letter
- E-Library-KNOVEL
- Local Sections
- Young Professional Groups
- Discounts, Insurance, and more
- Safety certificates - SACHE

www.aiche.org

Web Links

- www.aiche.org
- http://chenected.aiche.org
- http://www.aiche.org/CareerResources/
- http://apps.aiche.org/chemeondemand/home.aspx
- + many more … explore aiche.org on your own

Remember

AIChE

- Change is always here
- We need to prepare ourselves for the future
- Science and technology is not enough
- Value comes from commercialization into products people will pay for
- Opportunities in process and product technology
- Sustainable solutions are a key to success
- AIChE is there to support your need for change

Conclusions

AIChE

Thank You!

Questions?