

Stanley A. Gembicki
Chief Technology Officer and
Vice President of Corporate Research
UOP LLC

Biography

Stanley A. Gembicki is currently Chief Technology Officer and Vice President of Corporate Research for UOP LLC, a leader in developing and commercializing technology for license to the oil refining, petrochemical and gas processing industries. He received his bachelor's degree in Chemical Engineering from Purdue University and a Doctorate in Engineering Sciences from Dartmouth College. He has held a number of positions within UOP, and commercialized a broad range of catalytic and separation process applications for the refining and petrochemical industries.

Stan is a member of the American Institute of Chemical Engineers, the American Chemical Society and the Council for Chemical Research (CCR).

Innovation Challenges in Technology Development

Stanley A. Gembicki
Chief Technology Officer
uop LLC

**AICHE-ACS
Management Conference**

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UOP LLC



- **World's largest process technology licensing company**
 - 30,000+ patents
 - 70 licensed processes
- **90 years of providing innovative solutions for the hydrocarbon processing industry**
- **General Partnership – owned 50/50 by business units of Dow & Honeywell**
 - Independent operation - not a subsidiary of either company
- **About 2,800 employees – 50% in technology invention, development & delivery**

UOP LLC



- Develop technology that provides solutions to problems
- Transfer technology to customers
 - Refining
 - Petrochemical
 - Gas Processing
 - Manufacturing Industries
- License, design, engineer, and service process technology
- Manufacture & supply catalysts, molecular sieves, adsorbents, and specialized equipment

Today, I Would Like to Talk About

- **The challenges, enablers, and tools for technology innovation in the 21st century**
 - Defining the challenge, bypassing previously determined “limits
- **The role of innovation in meeting the current challenges of the chemical industry**
 - Industry outlook and key drivers

Process Industry Background

The history of the Chemical Industry is a story of technical accomplishment and innovation.

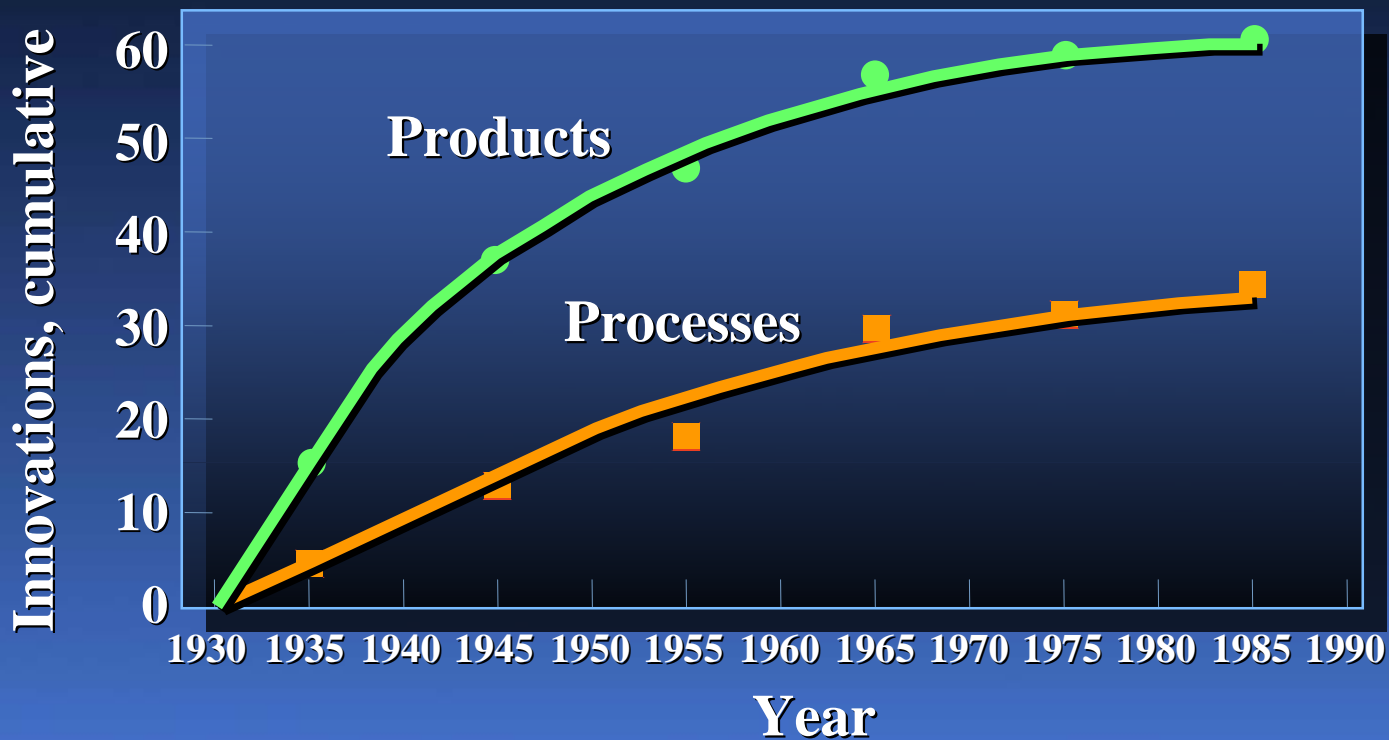
Achievements during the last century have led to both tremendous growth and a high level of technical sophistication.

The Need for Innovation



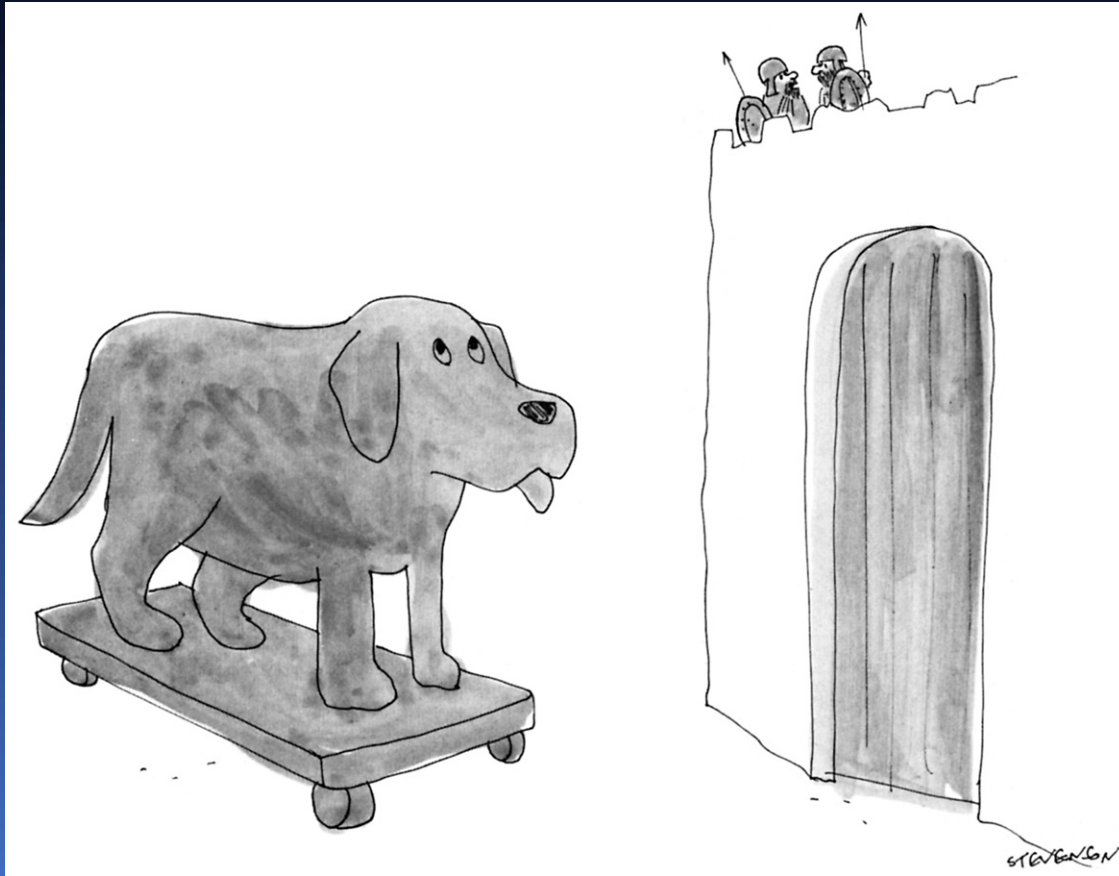
- **The 21st Century poses many challenges**

Major Innovation Has Slowed



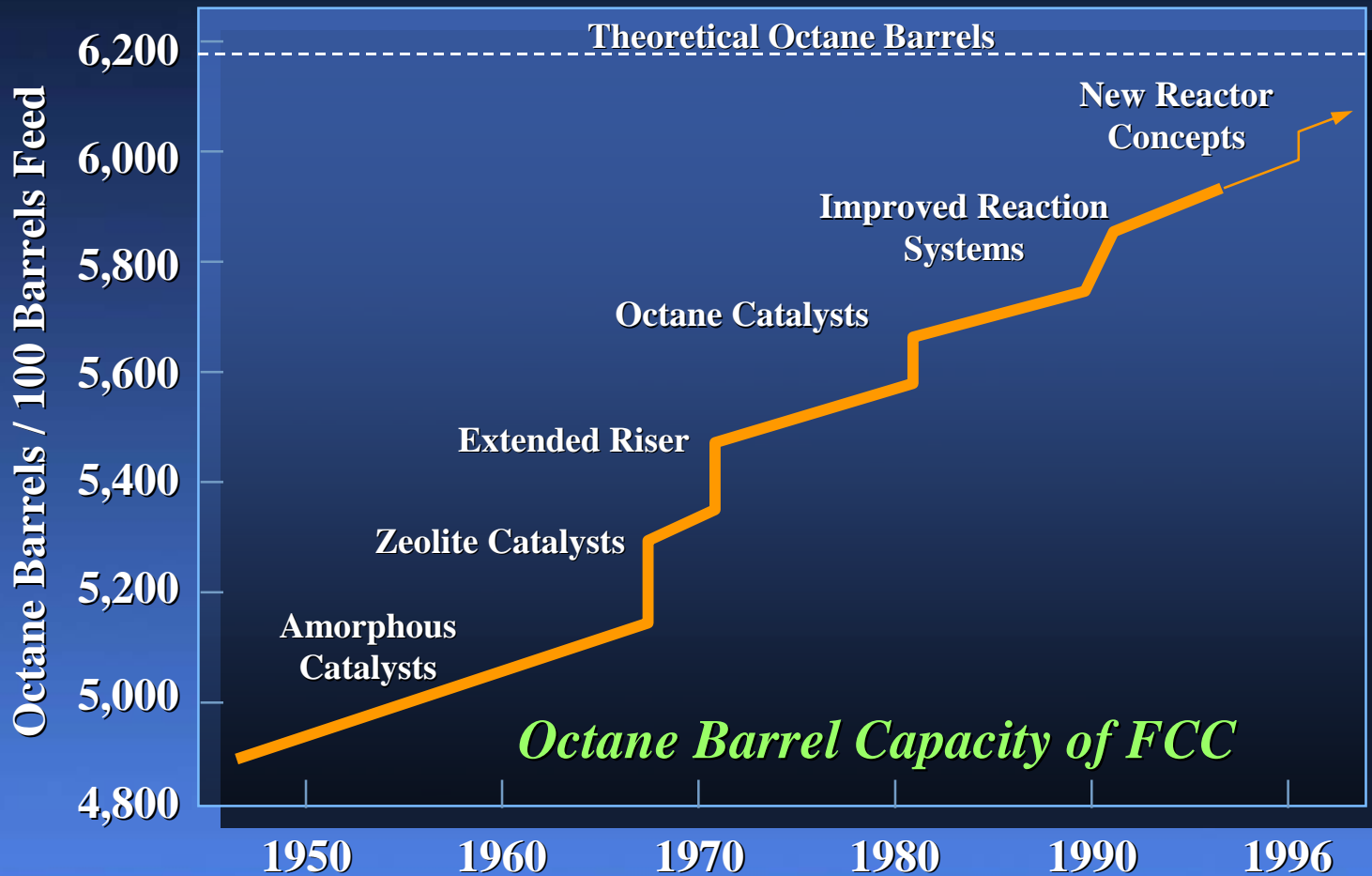
Product and process innovations from 1930 to 1985 are shown

Source: Chemtech 1995, 25(6), 6.

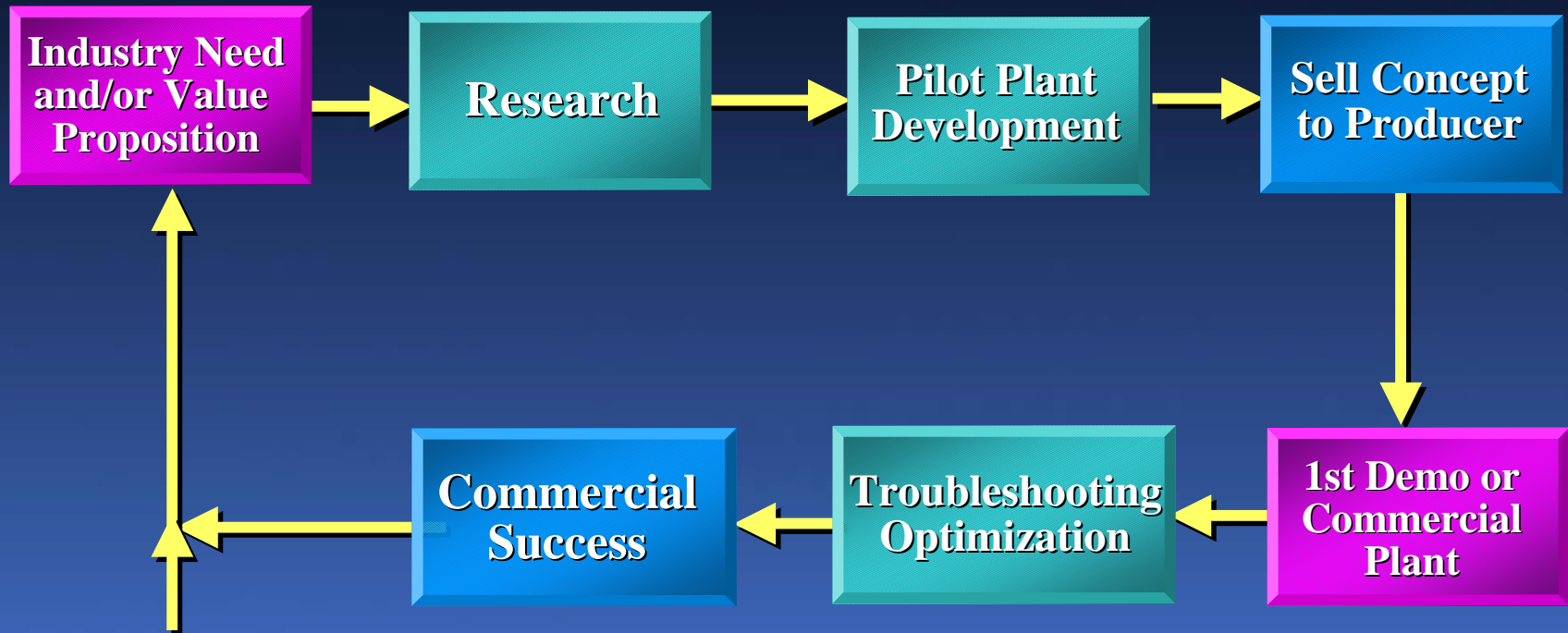


“I think the Greeks are running out of ideas!”

Continuous Innovation and Improvement: Fluid Catalytic Cracking



The Technology Innovation Cycle



Operating Experience
Incremental Process
Improvements
New Equipment
New Catalytic materials

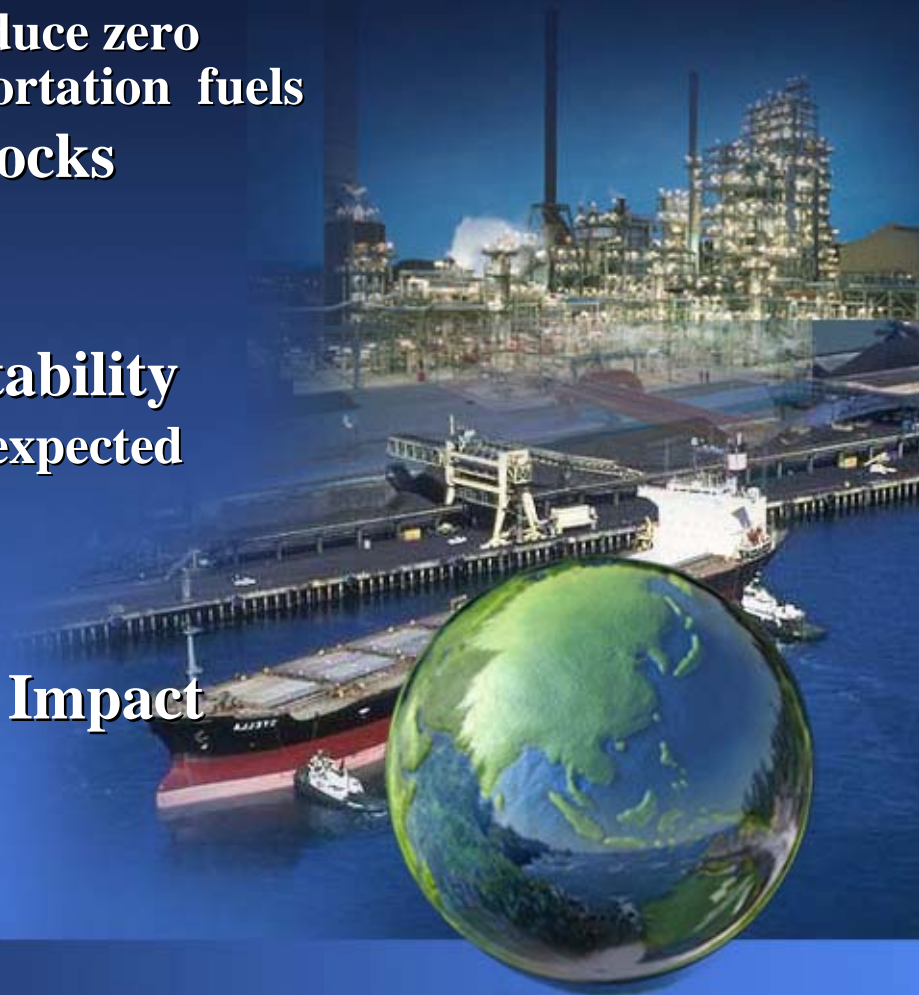
Long history of continuous
innovation in the Chemical
Industry

Steps for Increasing the Rate of Innovation

- **Have the mindset that innovation is not just about technology**
- **Work on the right problems**
- **Increase the focus on radical versus incremental innovation**
- **Leverage internal capabilities with external capabilities**
- **Speed is essential, have a sense of urgency**

Chemical Industry Realities

- **Clean Fuels**
 - Cost Effective Ways to produce zero sulfur/low nitrogen transportation fuels
- **Non Conventional Feedstocks**
 - Stranded Natural Gas
 - Renewable sources
- **Improved Industry Profitability**
 - Invest capital required for expected capacity requirements
 - Lower capital intensity
 - Reduce variable costs
- **Minimize Environmental Impact**
 - Plant emissions
 - Spent catalyst handling

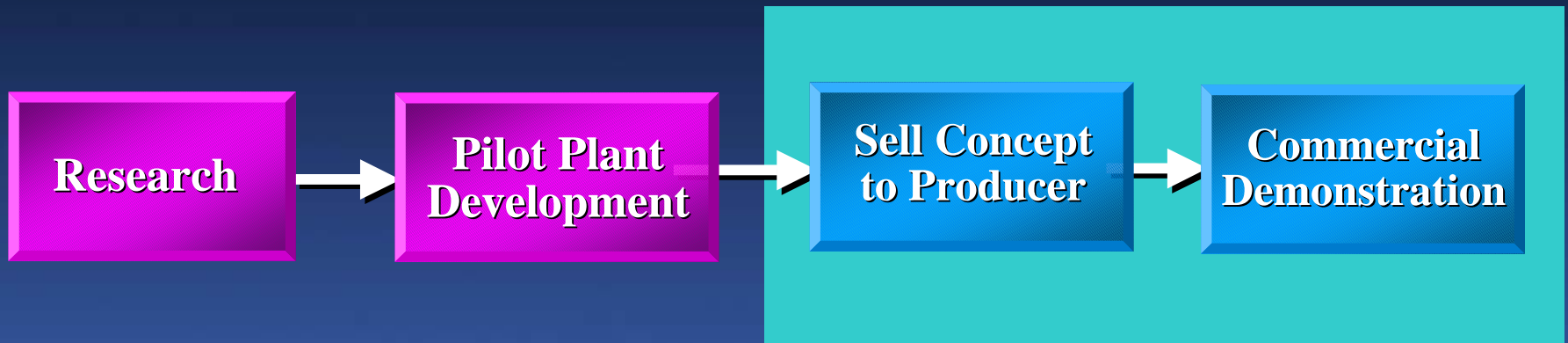


Innovation Enablers

- **Combinatorial Chemistry Approach to Discovery**
- **Advanced Catalyst Characterization at the Atomic Level**
- **The Application of Theoretical Methods to Catalysis to Understand Active Site Structure and Mechanism**
- **The Discovery of New Materials, Zeolites, NZMS, and their Application to Catalysis**
- **Process Miniaturization and Intensification**



Increasing Barrier to Technology Innovation: Commercialization



With new tools to drive innovation, the focus shifts to challenges downstream in new technology commercialization

Less Desire to Take Risk

- **Industry Consolidation**
 - Fewer, bigger companies
- **Profitability Challenges**
- **Larger plant sizes for economy of scale**
- **Limited discretionary capital spending in refining**



**RISK
AVERSION**

*Let someone else be
the first to try new
technology!*

Innovative People Remain the Key Ingredient

- A culture of innovation and the right mix of talented , innovative people can overcome the challenges required for new technology.

Summary

- **The Chemical Industry faces a number of significant challenges: feedstock availability; sustainability realities; profitability; capital intensity**
- **While technology is maturing in many markets, new “enablers” exist to push technology developments into the new century. Meeting key industry needs**
- **Industry trends are increasing the reluctance of producers to take risks in being the first to commercialize new technology**
- **“Partnering” between Technology developers and “Users” is critical to overcoming these barriers**