

CH0204 Organic Chemical Technology

INTRODUCTION

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Department of Chemical Engineering



Introduction to Chemical Industries



Global Chemical Production Scenario



Indian Chemical Production Scenario



Role of Chemical Engineers



Salary Package



Introduction to Chemical Industries



Global Chemical Production Scenario



Indian Chemical Production Scenario

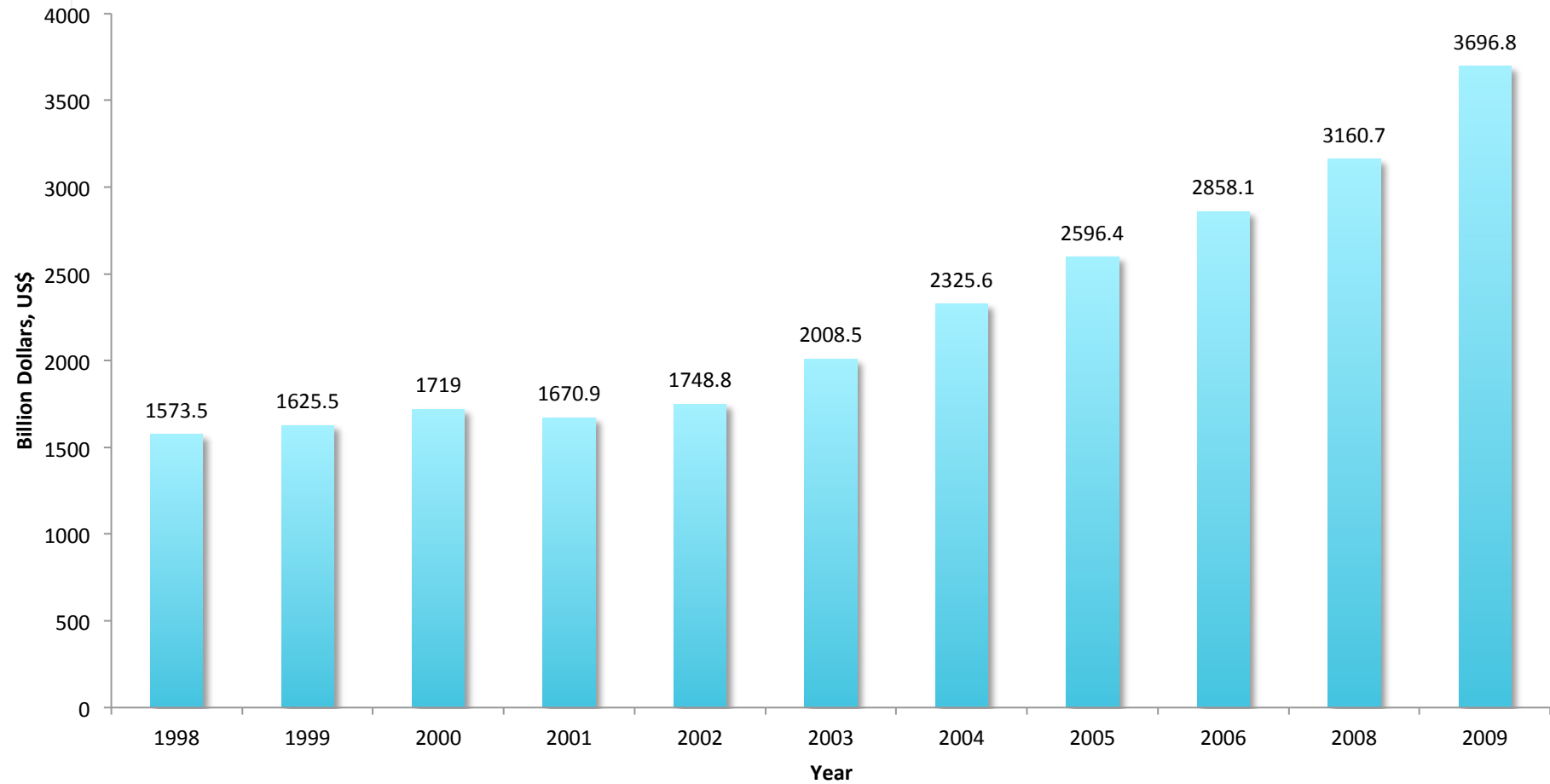


Role of Chemical Engineers



Salary Package

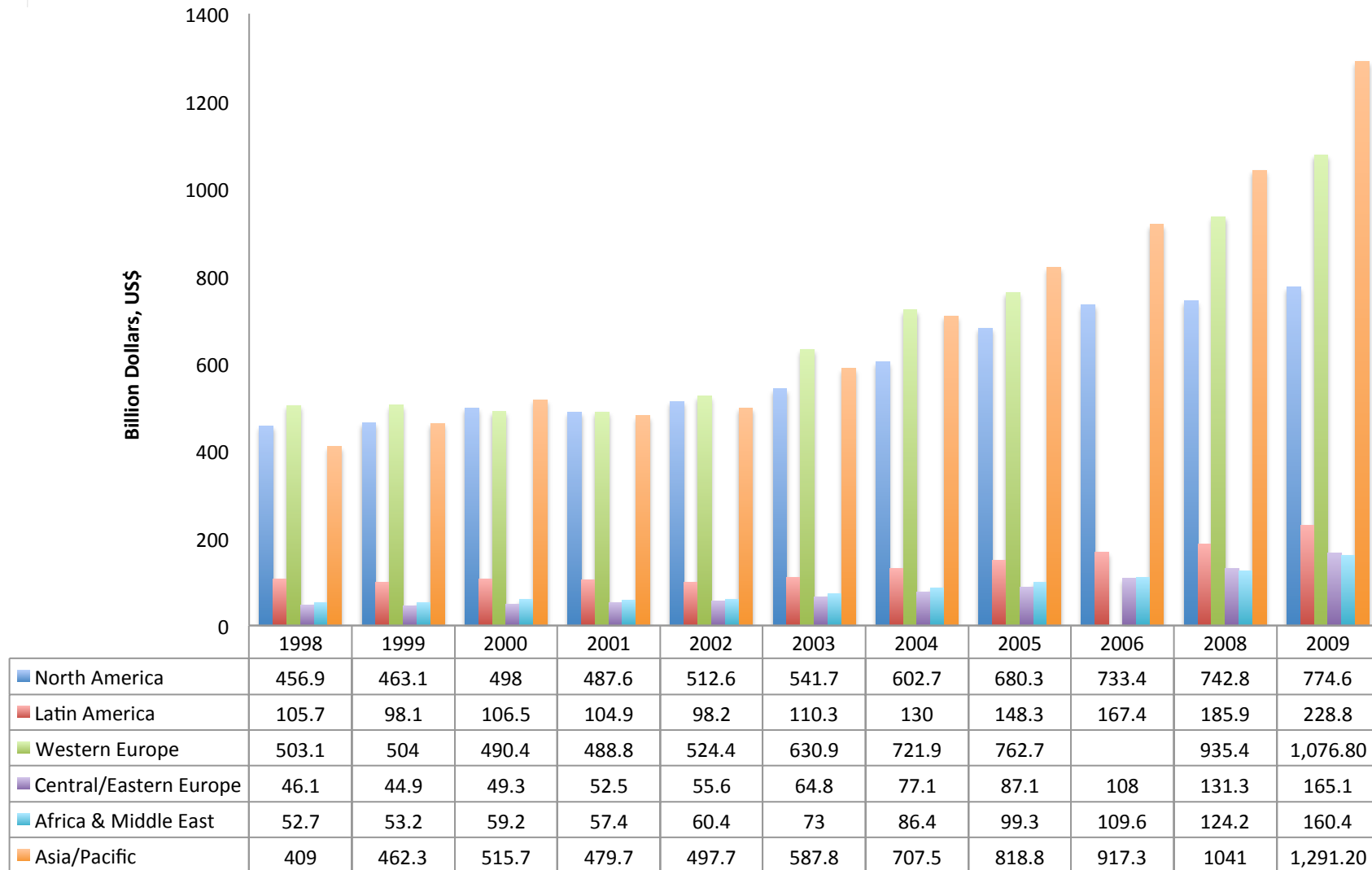
Global Chemical Production Scenario



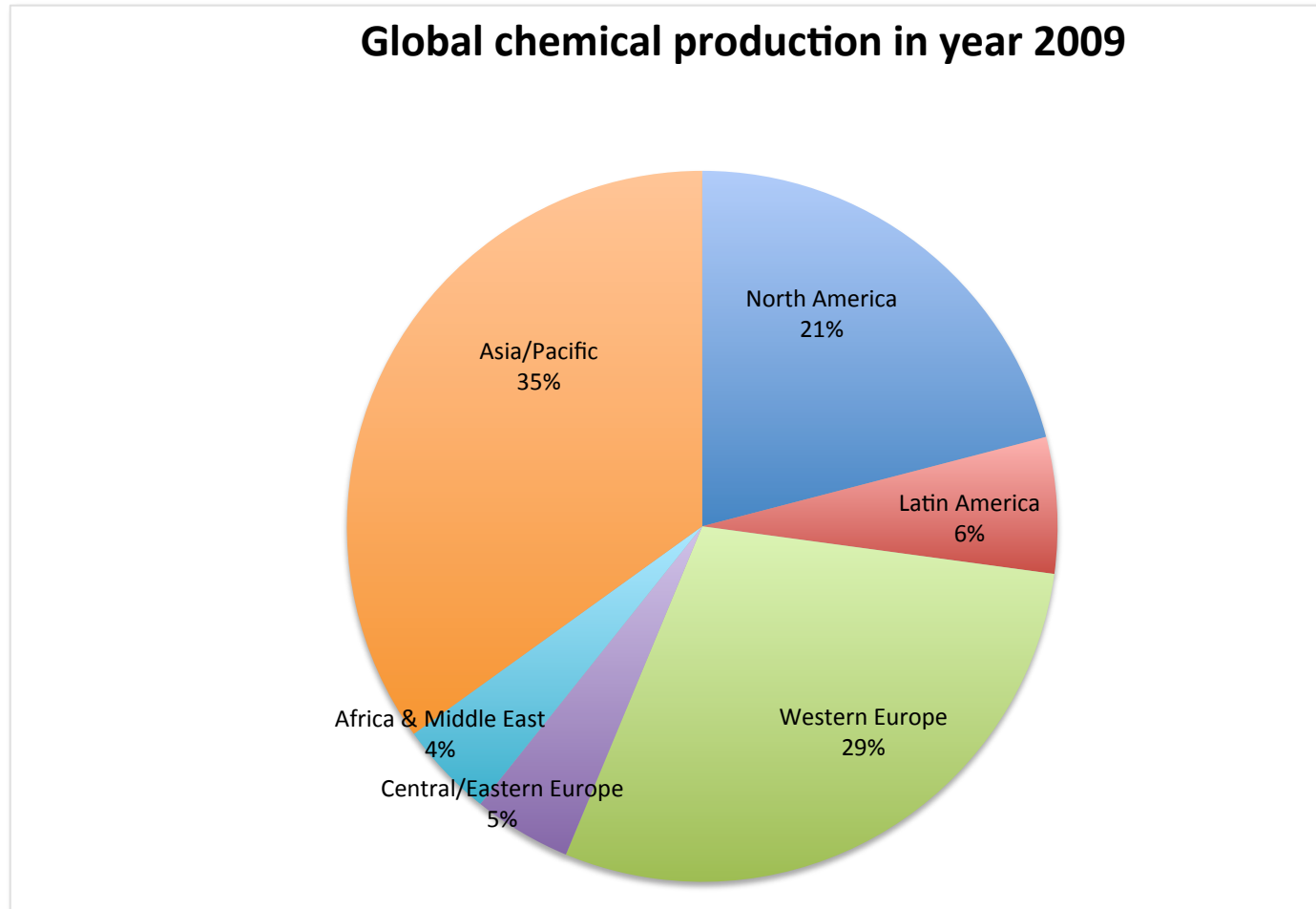
Global Chemical Production Scenario by region

Countries	1998	1999	2000	2001	2002	2003	2004	2005	2006	2008	2009
United States of America	416.7	420.3	449.2	438.4	462.5	487.7	540.9	610.9	657.7	664.1	689.3
Canada	21.1	21.8	25	24.8	25.8	30.5	36.2	40.2	43.7	45.4	47.4
Mexico	19.1	21	23.8	24.4	24.3	23.5	25.6	29.2	32	33.4	37.8
North America	456.9	463.1	498	487.6	512.6	541.7	602.7	680.3	733.4	742.8	774.6
Brazil	46.5	40	45.7	41.5	39.6	47.4	60.2	71.1	82.8	96.4	126.7
Other	59.2	58.1	60.8	63.4	58.6	62.9	69.9	77.2	84.6	89.5	102.1
Latin America	105.7	98.1	106.5	104.9	98.2	110.3	130	148.3	167.4	185.9	228.8
France	79.1	78.5	76.5	76.8	80.5	99.6	111.1	117.5	121.3	138.4	158.9
Germany	124.9	123.2	118.9	116.1	120.1	148.1	168.6	178.6	192.5	229.5	263.2
Italy	63.9	64.6	59.5	58.6	64.5	75.8	86.6	89.8	95.3	105.9	122.9
United Kingdom	70.3	70.1	66.8	66.4	69.9	77.3	91.3	95.2	107.8	118.2	123.4
Belgium	27.1	27	27.5	27.1	28.7	36.1	41.8	43.5	46.9	51.6	62.6
Ireland	16.9	20.1	22.6	22.9	29.1	32.3	33.9	34.9	37.5	46	54.8
Netherlands	29.7	29.4	31.3	30.6	32.2	40.1	49	52.7	59.2	67.9	81.7
Spain	31	30.8	30.8	31.9	33.4	42	48.9	52.7	56.7	63.7	74.8
Sweden	11.1	11.4	11.2	11	12.5	15.9	18.2	19.3	21.2	21.2	22.6
Switzerland	22.1	22.2	19.4	21.1	25.5	30.3	33.8	35.4	37.8	42.7	53.1
Other	27.1	26.8	25.9	26.4	27.9	33.5	38.6	42.9	46.2	50.3	58.9
Western Europe	503.1	504	490.4	488.8	524.4	630.9	721.9	762.7	822.4	935.4	1,076.80
Russia	23.8	24.6	27.4	29.1	30.3	33.4	37.5	40.9	53.1	63	77.6
Other	22.3	20.3	21.9	23.4	25.3	31.4	39.6	46.2	55	68.4	87.5
Central/Eastern Europe	46.1	44.9	49.3	52.5	55.6	64.8	77.1	87.1	108	131.3	165.1
Africa & Middle East	52.7	53.2	59.2	57.4	60.4	73	86.4	99.3	109.6	124.2	160.4
Japan	193.8	220.4	239.7	208.3	197.2	218.8	243.6	251.3	248.5	245.4	298
Asia-Pacific excluding Japan	215.2	241.9	276.1	271.5	300.5	369.1	463.9	567.5	668.8	795.5	993.2
China	80.9	87.8	103.6	111	126.5	159.9	205	269	331.4	406.4	549.4
India	30.7	35.3	35.3	32.5	33.5	40.8	53.3	63.6	72.5	91.1	98.2
Australia	11.3	12.1	11.2	10.8	11.3	14.9	17	18.7	19.1	22.8	27.1
Korea	39.3	45.5	56.3	50.4	54.9	64.4	78.7	91.9	103.4	116.7	133.2
Singapore	6.3	8.5	9.5	9.4	12.5	16.1	20	22	25.8	28.9	31.6
Taiwan	21.9	23.7	29.2	26.8	28.4	34.3	44.5	49.5	53.8	57.4	62.9
Other Asia/Pacific	24.8	29.1	30.9	30.8	33.3	38.8	45.5	52.9	62.9	72.2	90.8
Asia/Pacific	409	462.3	515.7	479.7	497.7	587.8	707.5	818.8	917.3	1041	1291.2
Total world shipments	1573.5	1625.5	1719	1670.9	1748.8	2008.5	2325.6	2596.4	2858.1	3160.7	3696.8

Global Chemical Production Scenario by region

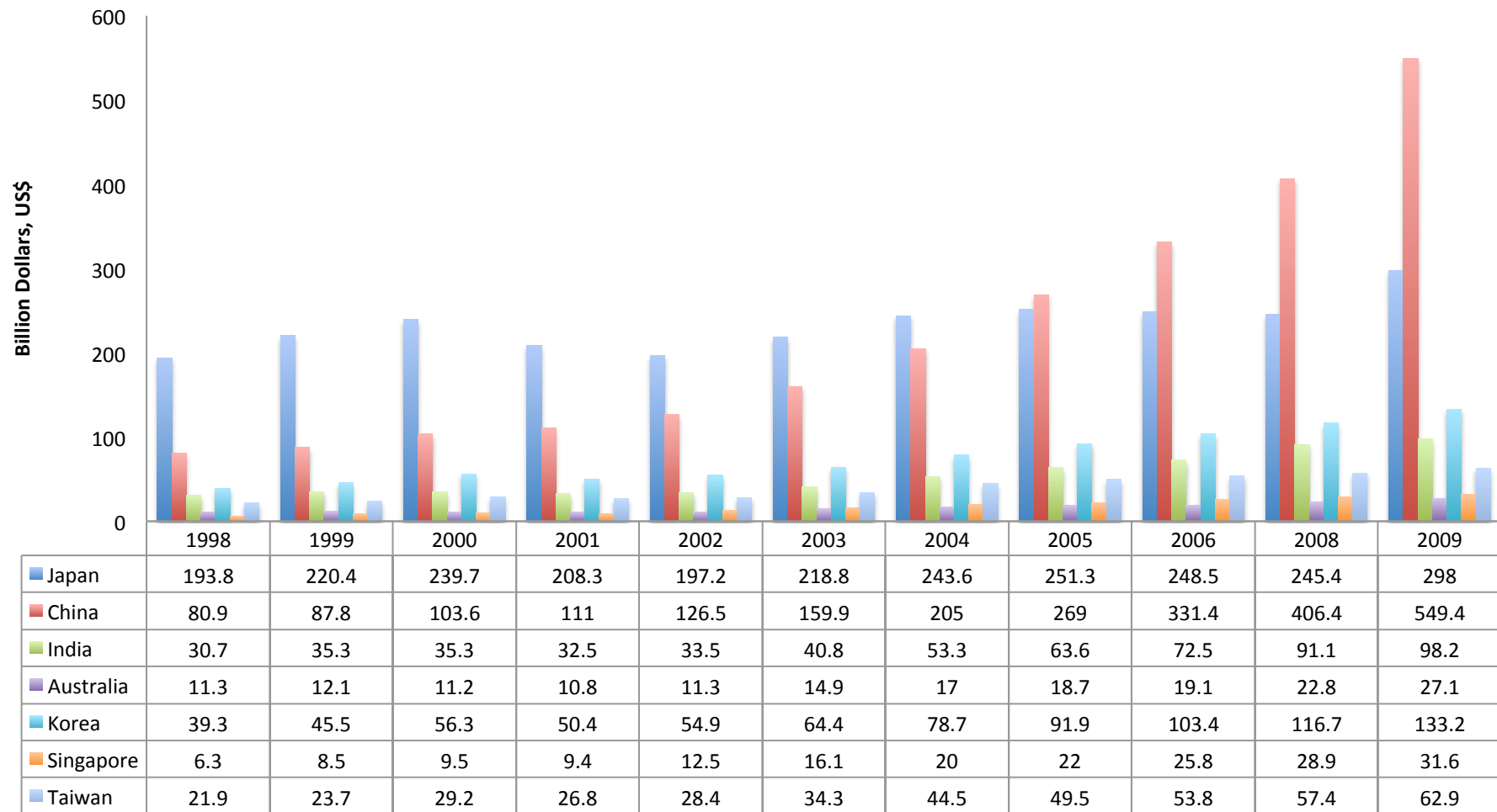


Global Chemical Production Scenario



Asia/ Pacific Chemical Production

Asia/Pacific Chemical Production





Introduction to Chemical Industries



Global Chemical Production Scenario



Indian Chemical Production Scenario

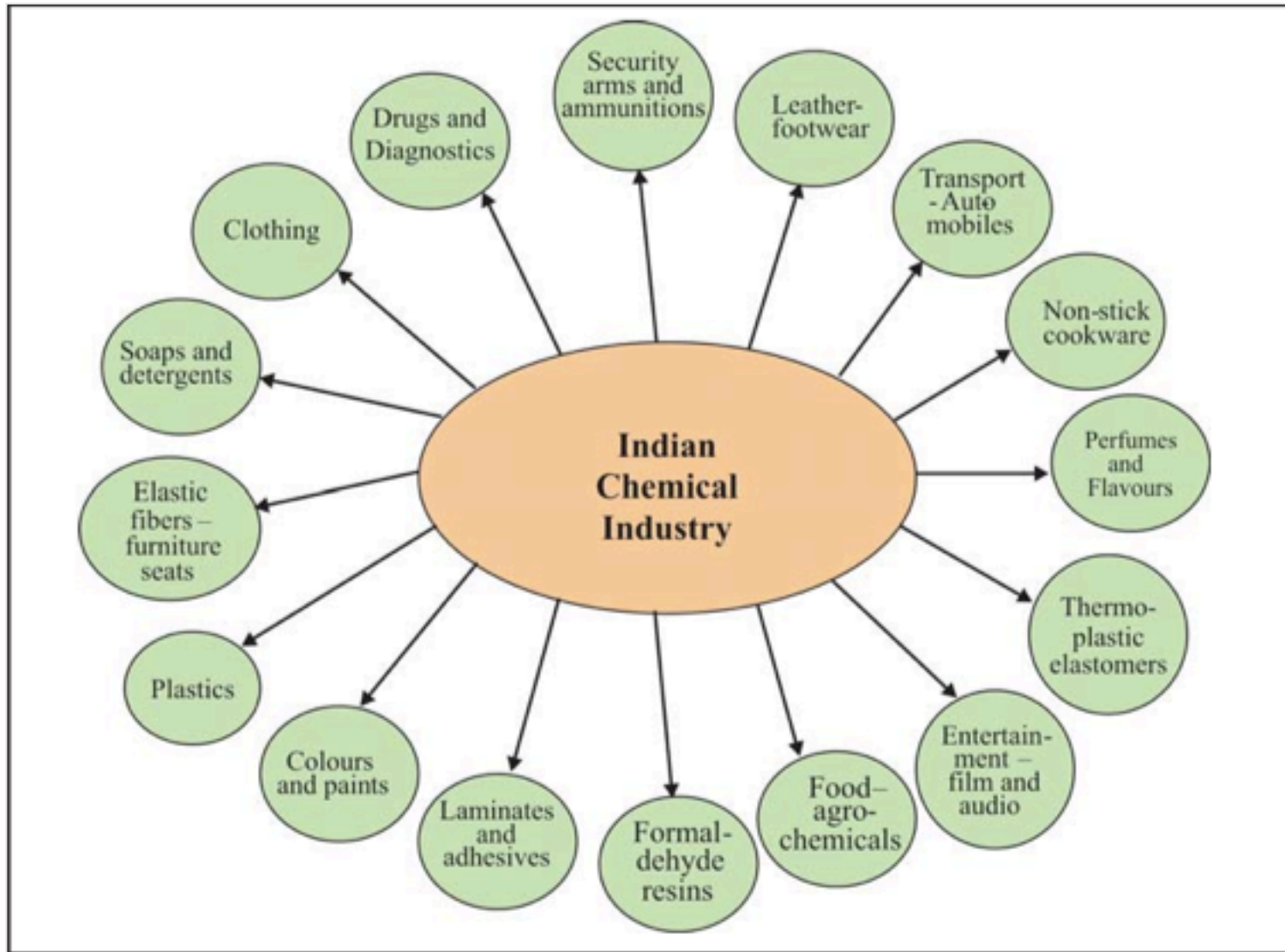


Role of Chemical Engineers

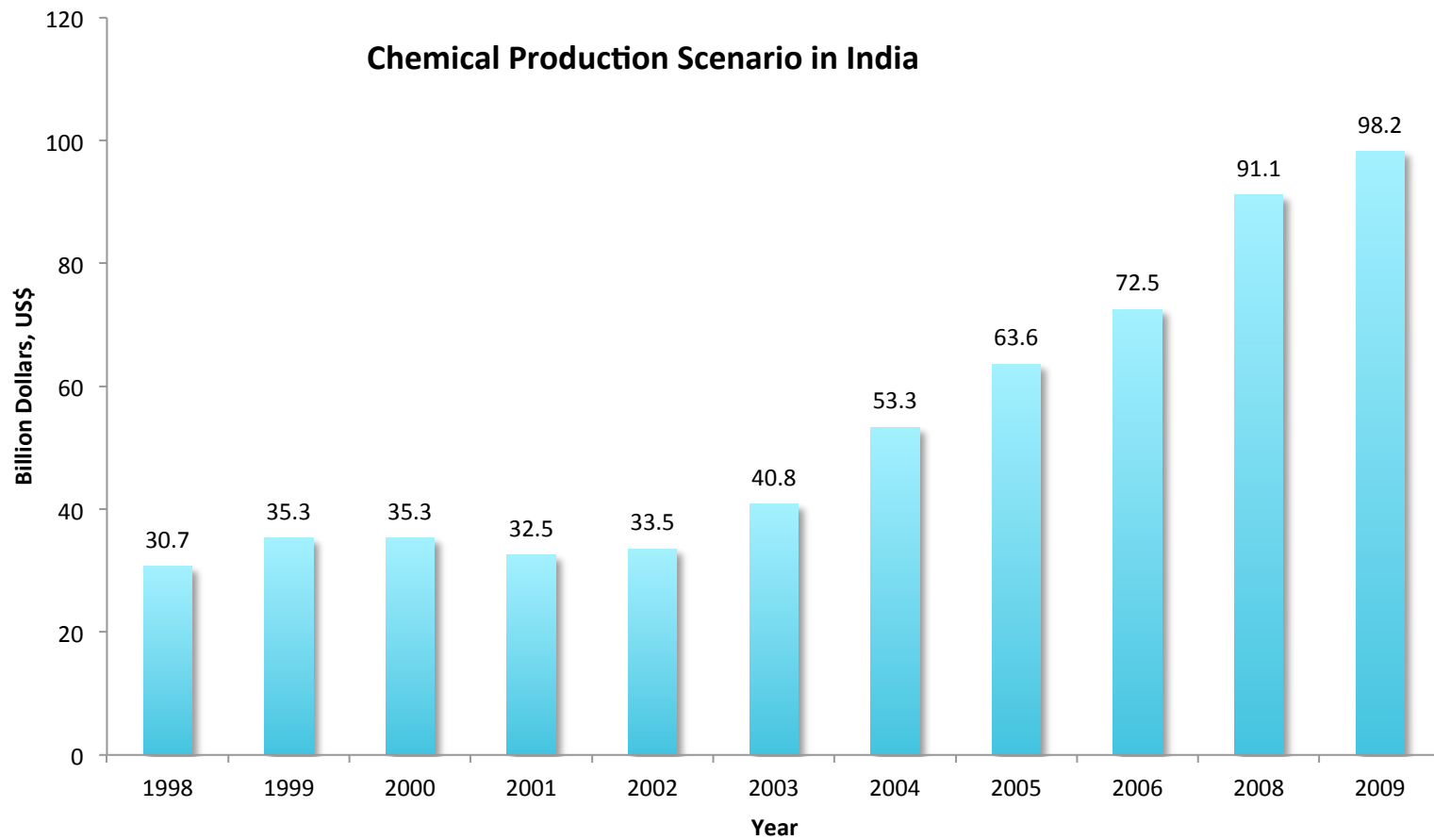


Salary Package

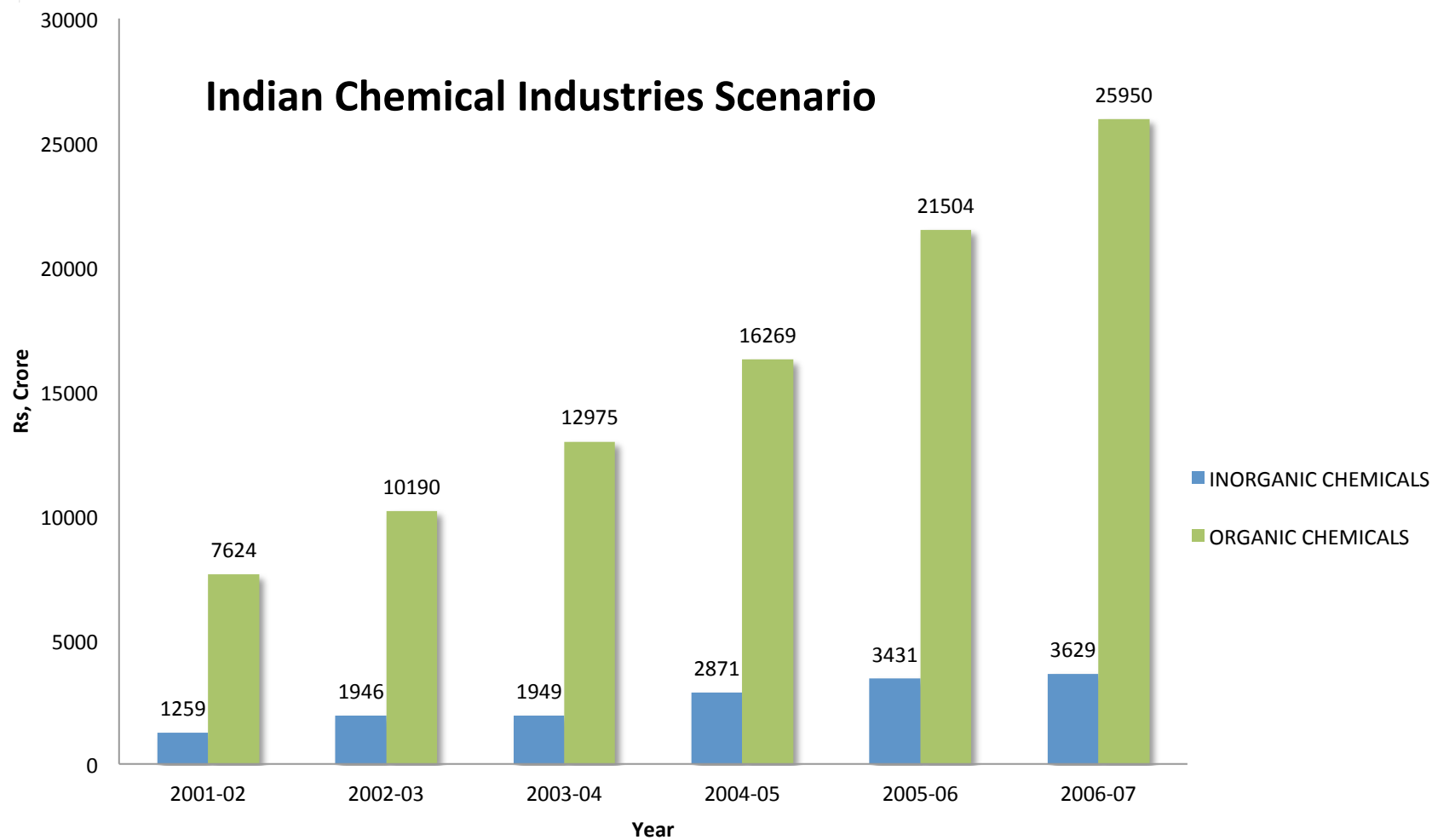
Indian Chemical Industries



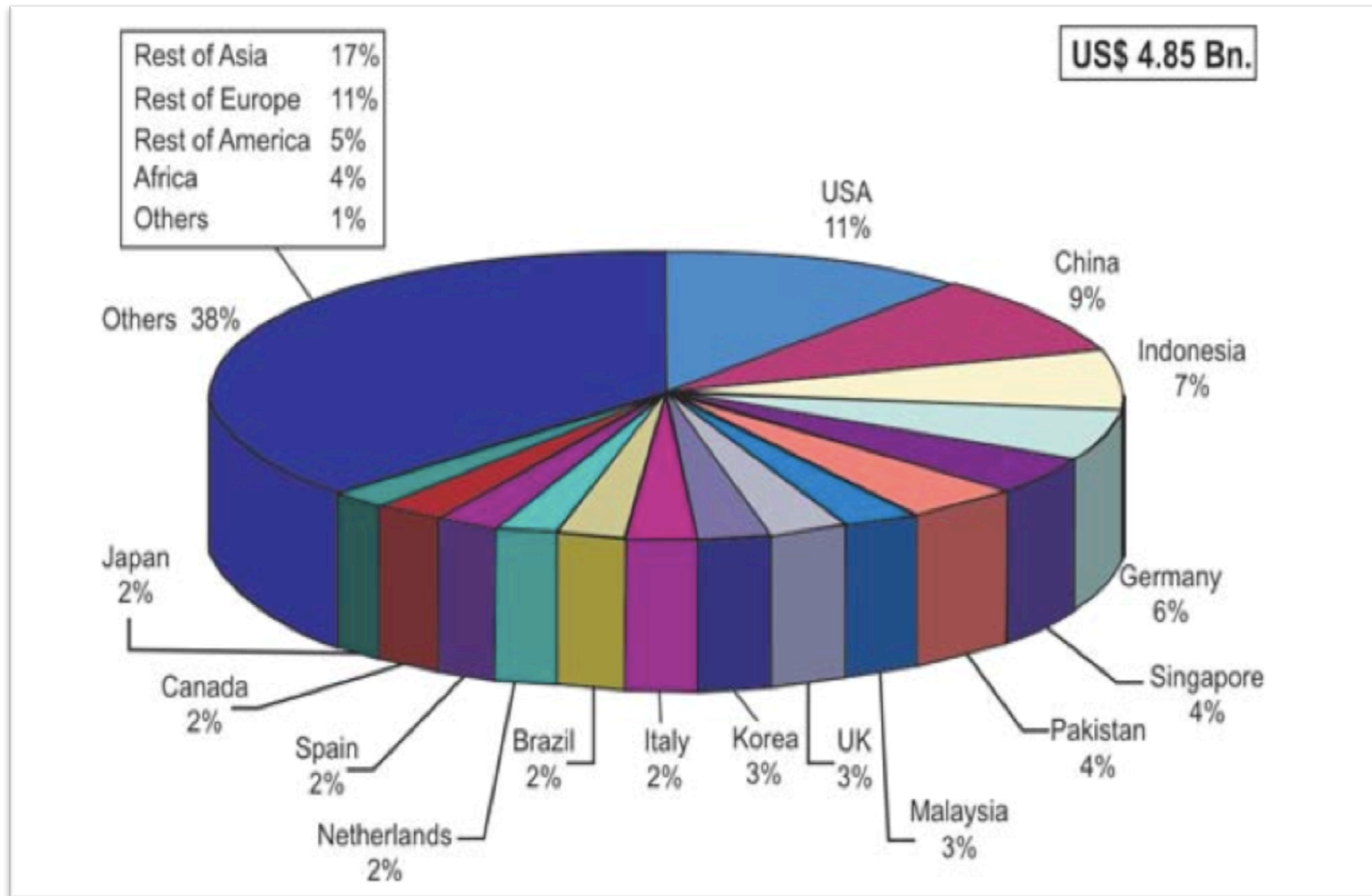
Indian Chemical Production Scenario



Indian Chemical Production Scenario



Indian Chemical Production Scenario



Indian Chemical Production Scenario

Basic Chemicals	Alkali
	Inorganic
	Organic
	Pesticide
	Dyes and Dyestuff
Basic Petrochemicals	Synthetic Fiber Yarn
	Polymers
	Elastomers
	Synthetic Detergents
	Performance Plastics
Petrochemical Intermediates	Fiber Intermediates
	Olefins
	Aromatics

Indian Chemical Production Scenario

ALKALI CHEMICALS	SODA ASH
	CAUSTIC SODA
	LIQID CHLORINE
INORGANIC CHEMICALS	ALUMINIUM FLOURIDE
	CARBON BLACK
	POTASSIUM CHLORATE
	TITANIM DIOXIDE
	RED PHOSPHORUS
	SODIUM CHLORATE
ORGANIC CHEMICALS	ACETIC ACID
	ACETIC ANHYDRIDE
	ACETONE
	PHENOL
	METHANOL
	FORMALDEHYDE
	NITROBENZENE
	CITRIC ACID
	MALEIC ANHYDRIDE

PESTICIDES	ENDOSULPHAN
	CALAXIN
	BUTACHLOR
	ATRAZINE
DYES & DYESTUFF	AZO DYES
	ACID DIRECT DYES
	DISPERSE DYES
	FAST COLOUR BASES
	INGRAIN DYES
	OIL SOLUBLE DYES
	OPTICAL WHITENERS
	ORGANIC PIGMENTS
FOOD COLOURS	



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Role of Chemical Engineers



Salary Package



Role of Chemical Engineers

A. I. Ch. E 's definition:

*“The application of principles of the **chemical and physical sciences** together with the principles of **economics and human relations**, to fields that pertain directly to **processes and process equipment**, in which matter is treated to effect a change in a **state, energy content, or composition**”*



Role of Chemical Engineers

Chemical Engineering has to do with industrial processes in which **raw materials are changed or separated into useful products.**

The Chemical Engineer must **develop, design and engineer** both the complete process and the equipment used; choose the proper raw materials; operates the plant efficiently, safely and economically; and see to it that products meet the requirements set by the customers.

Chemical engineering is both **art and science**. Whenever science helps the engineer to solve a problem, science should be used.

When, as usually the case, science does not give a complete answer, it is necessary to use **experience and judgment**.



Role of Chemical Engineers

Including all engineering aspects involved in the development of new, modified or expand existing commercial process in a chemical or biochemical plant.

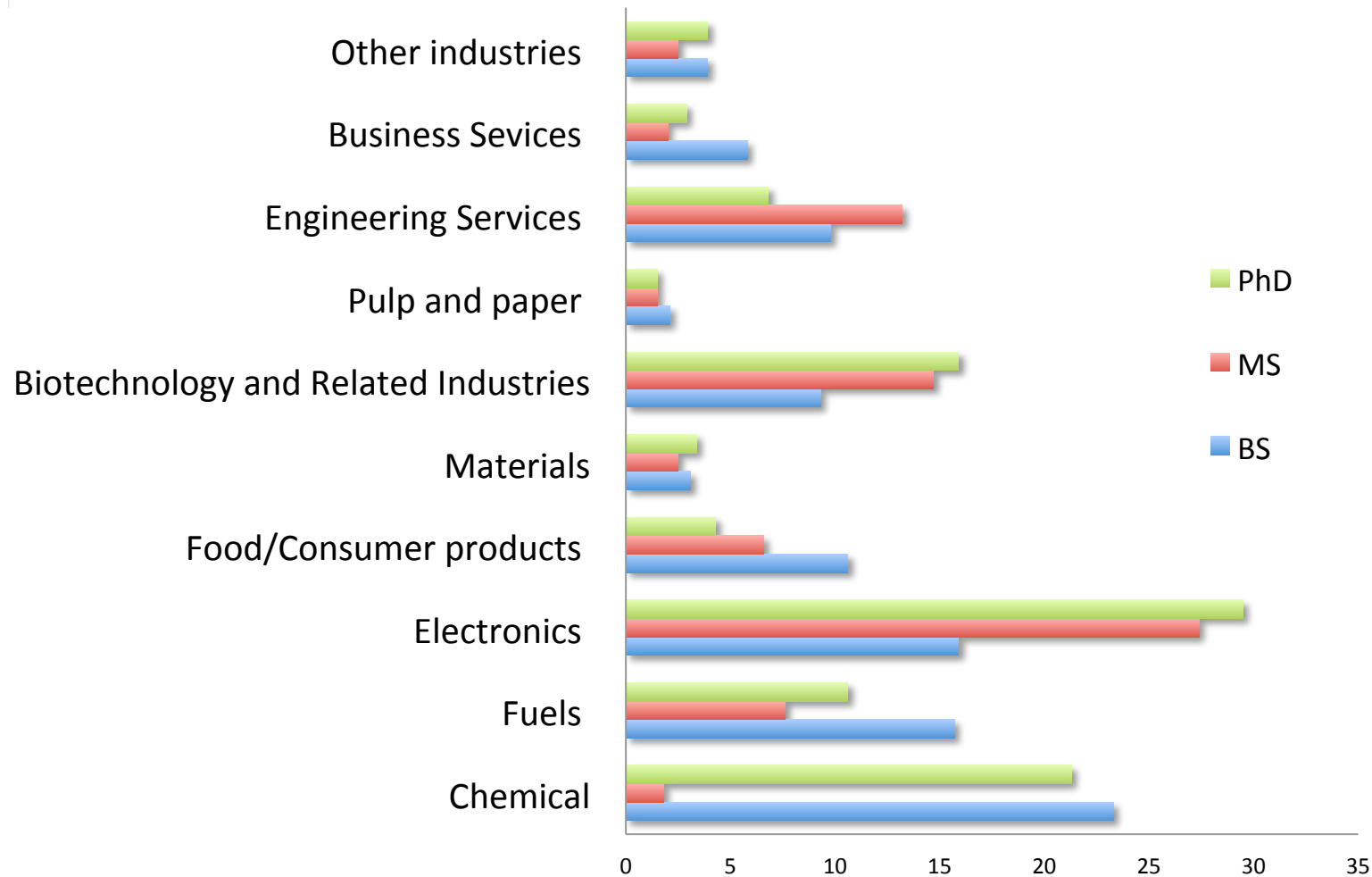
In this development, the chemical engineer will be making,

1. Economic evaluations of new processes
2. Designing individual pieces of equipment for the proposed new venture
3. Developing a plant layout for co ordination of the overall operation.

Because of these many duties often chemical engineer is called as *design engineer*.

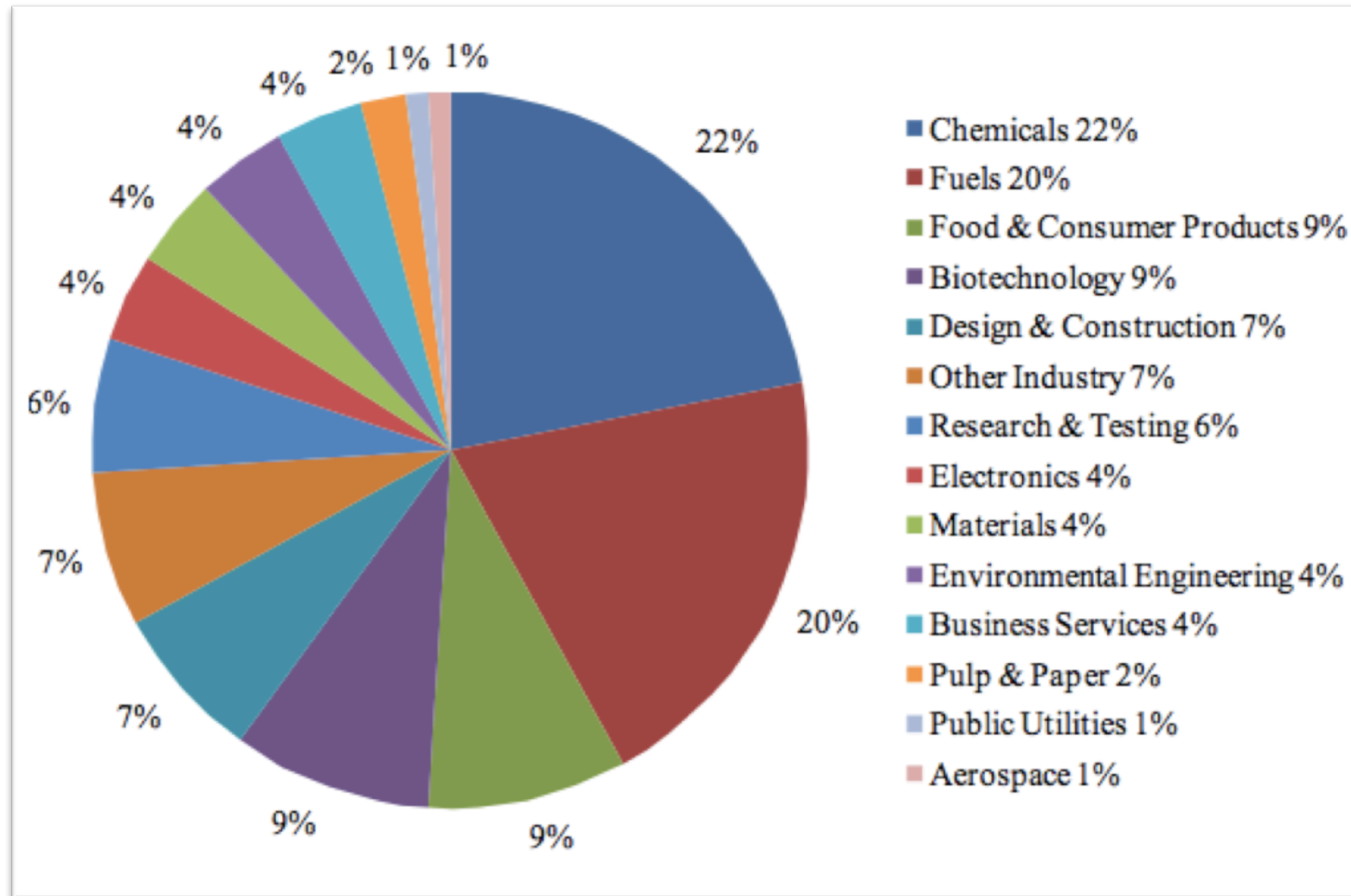
On the other hand, a chemical engineer specializing in economic aspects of design is often referred to as a *cost engineer*.

Role of Chemical Engineers



Role of Chemical Engineers

Industries those hires chemical engineers



Role of Chemical Engineers

Professional Societies



www.aiche.org



www.dechema.de



www.icheme.org



www.iiche.org.in



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Role of Chemical Engineers



Salary Package

Salary Package



First Look Shows Salary Offers Down for Class of 2010

Average salary offers to new college graduates in the Class of 2010 have dipped slightly compared to salaries reported a year ago. Currently, the overall average offer to a bachelor's degree graduate is \$48,351, down 2 percent from the average offer of \$49,353 made to Class of 2009 bachelor's degree graduates.

The dip reflects the decreased demand for new grads, which was projected by employers back in August. At that time, employers responding to the *Job Outlook 2010 Fall Preview* survey reported plans to decrease their college hires by about 7 percent. Moreover, only 29.2 percent of those respondents reported plans to increase average salaries to Class of 2010 graduates. In fact, although there is no direct correlation, the total number of offers reported is down 29 percent compared to last year's Winter report, despite the fact that the same number of schools provided data. Consequently, the overall 2 percent drop is no surprise. However, it is important to note that not all disciplines saw a decrease in their average offer

to these graduates; this year, retail/wholesale firms offered these graduates an average offer of \$40,235, up 1.1 percent from \$39,778 last year at this time.

While finance graduates topped the list of majors in demand for Class of 2010 graduates, their average salary offer shows a minor decrease of 0.4 percent to \$49,607. Investment banks were the employers most interested in these graduates, and extended offers that averaged \$57,263.

The average salary offer to marketing graduates slipped by 1.9 percent to \$42,499. They garnered interest from retail/wholesale employers, who offered them an average of \$48,171.

Coming out on top in this report are graduates with computer-related degrees (computer programming, computer science, computer systems analysis, and information sciences/systems). As a group, these graduates posted a 6.1 percent increase to their average salary offers, up from \$56,128 to \$59,570. In comparison,



Salary Package

Top-Paid Bachelor's Degrees

Undergraduate Major	Salary
Chemical engineering	\$ 63,200
Computer science	\$ 60,400
Mechanical Engineering	\$ 57,000
Civil Engineering	\$ 51,600
Economics	\$ 50,500
Accounting	\$ 48,100
Sociology	\$ 34,800
English	\$ 34,300
Psychology	\$ 33,600



Salary Package

Top-Paid Bachelor's Degrees

Undergraduate Major	Average Salary
Petroleum Engineering	\$86,220
Chemical Engineering	\$65,142
Mining & Mineral Engineering (incl. geological)	\$64,552
Computer Science	\$61,205
Computer Engineering	\$60,879
Electrical/Electronics & Communications Engineering	\$59,074
Mechanical Engineering	\$58,392
Industrial/Manufacturing Engineering	\$57,734
Aerospace/Aeronautical/Astronautical Engineering	\$57,231
Information Sciences and Systems	\$54,038



Chemical Engineers in other pursuits

Nobel Laureates

Arts, Literature and Entertainment

Business

Science and Technology

Chemical Engineers in other pursuits



NOBEL LAUREATES

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1 LARS ONSAGER (1903–1976)
Physical chemist and Nobel Laureate
Studied chemical engineering at Norwegian Institute of Technology, graduated 1925. Established the fundamental bases of irreversible thermodynamics, "Reciprocal relations in irreversible processes" (1929). Awarded Nobel Prize in Chemistry (1968). Purview included order-disorder transitions and super fluids.
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2 LINUS PAULING (1901–1994)
Scientist, educator, activist and two-time Nobel Laureate
BS in chemical engineering, Oregon Agricultural College (now Oregon State) (1922). Foremost 20th century chemist. Awarded Nobel Prize in Chemistry (1954) for research into chemical bonds. Awarded Nobel Peace Prize (1962) for advocacy against nuclear weapon proliferation.
- 3 EUGENE WIGNER (1902–1995)**
Nobel Laureate
Chemical engineering graduate of Technical University of Berlin (1925). Introduced symmetry theory to quantum physics and chemistry. Awarded Nobel Prize in Physics (1963).

Balasubramanian S

ARTS, LITERATURE, ENTERTAINMENT



4 FRANK CAPRA (1897–1991)

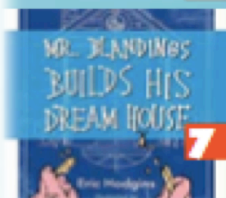
Academy Award-winning movie director
BS in chemical engineering, Throop Institute (Now Caltech) (1918). Directed more than 50 films, including "It Happened One Night" (1934); "Mr. Smith Goes to Washington" (1939); "Know Your Enemy — Japan" (1943); "It's a Wonderful Life" (1946); "Pocketful of Miracles" (1961).

5 WILLIAM DENNY

Fictional Texas chemical engineer in the novel, "Ship of Fools" by Katherine Anne Porter. Character portrayed in the film version by Lee Marvin.

6 VIRGIL HILTS

Fictional, cool-mannered American POW pilot and student of chemical engineering in the movie "The Great Escape" (1963). Portrayed by Steve McQueen.



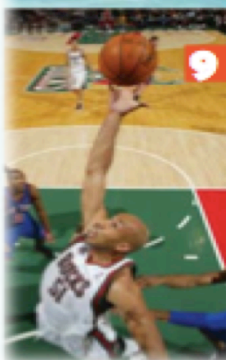
7 ERIC HODGINS (1899–1971)

Author
Best known for the novel, "Mr. Blandings Builds his Dream House" (1946), made into a popular movie starring Cary Grant (1948).



8 DOLPH LUNDGREN

Movie actor
Born 1957. MS in chemical engineering, Univ. of Sydney, Australia (1982). Received Fulbright Scholarship to MIT in 1983, but pursued acting instead. Played boxer Ivan Drago in "Rocky IV."



9 MICHAEL RUFFIN

Pro basketball player
Born 1977. BS in chemical engineering, Univ. of Tulsa (1999). Milwaukee Bucks forward-center, and one of top "Good Guys" in sports (Sporting News, 2006). Now in his eighth NBA season. Academic All-America — First Team.

BUSINESS

10 HERBERT D. (TED) DOAN (1923–2006)



Businessman and philanthropist
BS in chemical engineering, Cornell Univ. (1949). Chairman of The Herbert H. and Grace A. Dow Foundation; Dow Chemical President (1962–1971). Grandson of Dow founder Herbert Henry Dow, and the last Dow family member to serve as CEO of Dow Chemical.

11 ROBERT C. GOZUETA (1931–1997)



CEO of The Coca-Cola Company
BS in chemical engineering, Yale Univ. (1953). Chairman, director and CEO of Coca-Cola from 1980–1997. Credited with modernizing company.

12 WILLIAM KOCH



Businessman and philanthropist
Born 1940. BS (1962), MS (1963) and DSc (1969) in chemical engineering, MIT. Founder and president of The Oxbow Group, 1992 America's Cup winner. Collector of art.

13 JAMES J. PADILLA



Automobile industry executive
Born 1946. BS and MS in chemical engineering, Univ. of Detroit, Mercy. Former Ford Motor Company President and Chief Operating Officer. Director of engineering and manufacturing for Jaguar cars.

GOVERNMENT, POLITICS

14 SAMUEL W. BODMAN



Financier and U.S. Secretary of Energy
Born 1938. BS in chemical engineering, Cornell Univ. (1961); ScD in chemical engineering, MIT (1965). 11th U.S. Secretary of Energy (2005 – present); Deputy Secretary Department of Commerce; Associate professor and former director of MIT's School of Engineering Practice.

15 VILMA ESPIN (1930–2007)



Revolutionary leader and Cuba's unofficial "First Lady"
One of the first Cuban woman chemical engineers; MIT post-graduate work (1955). Married to Cuban President Raúl Castro. President of the Federation of Cuban Women since its founding in 1960. Unofficial first lady of former Cuban president Castro, who was divorced during his tenure.

SCIENCE & TECHNOLOGY

16 BEATRICE ALICE HICKS (1919–1979)



Inventor and cofounder of Society of Women Engineers (SWE)
BS in chemical engineering, Newark College of Engineering (now NJIT) (1939). Helped build SWE from a 60-member organization to one with more than 17,000 members today. First female engineer at Western Electric. Developed RF communications oscillator.

17 CARL V. S. PATTERSON



Conceived generation of visuals using rare earth fluorescence; invented the X-ray screen (fluoroscope) and oversaw manufacture; patent applicable to color TV.

18 HENRY T. SAMPSON



Inventor
Born 1934. BS in chemical engineering, Purdue Univ. (1956). Co-invented "gamma-electric cell" (1971) to detect underground nuclear radiation; technology applied to cell phones in 1983.

19 EDWARD TELLER (1908–2003)



"Father of the H-bomb"
BS in chemical engineering, Univ. of Karlsruhe, Germany. Best known for work on Manhattan Project and his role in developing the hydrogen bomb. Contributions included Brunauer-Emmet-Teller (BET) adsorption isotherm and Gamow-Teller subatomic particle behavior classification. Outspoken advocate for nuclear testing programs and increasing nuclear arsenals.

20 JOHN VON NEUMANN (1903–1957)



Mathematician and physicist
Diploma in chemical engineering, Federal Institute of Technology, Zurich (1925). Pioneer in game theory, nuclear deterrence, and modern computing.

For more stories about the
"chemical engineers of the century,"
visit the AIChE Web's
Centennial Celebration site:
www.icheme.org/100/.



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Thank you

See you with more interesting stuffs
in next lecture