

Technology and Costs

Technoeconomics – Energy & Chemicals (TECH)



The **Technoeconomics – Energy & Chemicals (TECH)**program is globally recognized as the industry standard source of process evaluations of existing, new and emerging technologies of interest to the chemical and energy industries.



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TECH's comprehensive studies include detailed technology analyses, process economics, as well as commercial overviews and industry trends.

TECH Program Scope

TECH issues twenty reports per program year, including eight petrochemical updates (building blocks, intermediates and polymers) and twelve special topics covering areas such as specialty/performance materials, refinery products, energy technologies, and engineering know-how.

TECH reports involve detailed reviews of the available literature (patents, scientific and trade journals, etc.), as well as extensive liaison with industry (technology licensors, producers, EPC contractors), and NexantECA know-how. Reports cover:

- Trends in chemical technology
- Strategy/business overview
- Process Technology
 - Chemistry
 - Process flow diagrams and descriptions of established conventional and new/emerging processes
- Process economics comparative cost of production estimates for different technologies/process routes across different geographic regions
- Overview of product applications and markets for new as well as established products
- Regional supply and demand balances, including capacity tables of plants in each region (listing plant owner, nameplate capacity, location and production process employed, when available
- Regulatory and environmental issues where relevant

Petrochemical Updates

Petrochemical updates are designed to give up-to-date ("state of the art") information on major petrochemical building blocks, intermediates, and polymers. Update topics are reviewed on a three to five year cycle.

Special Topics

Special topics cover a wide variety of areas, ranging from niche markets to subjects currently considered "hot" or making grounding breaking news. Subjects are chosen based on clients' requests and NexantECA's review/perception of the current state of affairs in the industry.

Topics typically covered include:

- Specialty chemicals and polymers for example, cyclic olefin copolymers, specialty polyamides
- Advanced materials for example, carbon fiber and solar grade polysilicon
- Oil refinery products for example, lube oil and catalytic processing of crude residue
- "Hot" topics for example, plastics recycling technologies, meeting new bunker fuels specifications, international shale gas, sustainability in the chemical industry
- Engineering for example, project scale-up (lab to industrial plant implementation) and chemical energy storage



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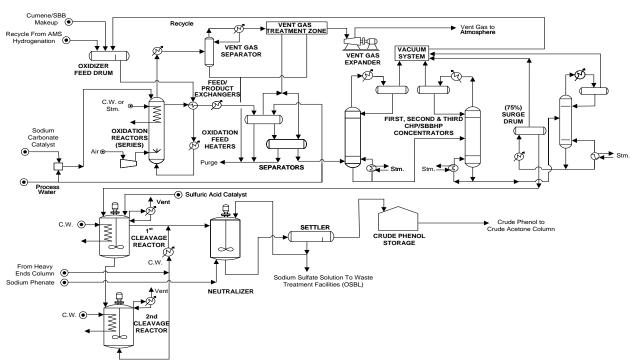


The TECH program is committed to delivering reliable and commercially grounded analysis.

A typical TECH report includes an introduction, where an overview of the business is given, a summary of the technology licensing status and major producers, key physical properties are outlined. Most TECH reports also give an overview of strategic considerations from the perspective of a new entrant to the business.

The core of a TECH report is focused on discussion of the chemistry, process design and economics of developing/emerging technologies compared with the commercially dominant technologies against which they will compete; coupled with an overview of commercial market applications and analysis of the key regional supply/demand markets.

Sample Process Flow Diagram



Process Economics

In close liaison with the industry (producers, licensors, EPC contractors), NexantECA know-how/industry experience, review and analysis of the available literature (e.g., patents, scientific journals), as well as product specifications, NexantECA develops reliable and dependable assessments of the process economics for commercially established and pertinent emerging/developing technologies.

TECH Reports provide multi-regional cost of production estimates in metric units. Typical location bases for the economics would include 2 to 4 of the following:

- Brazil
- China
- Eastern Europe
- Japan

- Middle East
- Western Europe
- South East Asia
- United States Gulf Coast (USGC)

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Sample Cost of Production Table

				CAPITAL COST			MILLION U.S.\$		
Plant Start-up	1Q2010	1Q2010 ISBL					61.4		
Analysis Date		2010 OSBL				12.2			
Location		USGC Total Plant Capital					73.7		
Capacity	274.6	Thousand Tons/yr		Other Project			18.4		
				-	t Investment		92.1		
Operating Rate 100 perce Throughput 274.6 Thou				Working Capit			9.2		
		Thousand Tons/yr	Total Capital Employed		II Employed		101.3		
				UNITS	PRICE		ANNUAL		
				Per Ton	U.S.\$	U.S. \$	COST U.S.\$	U.S. \$	
PRODUCTION COST SUMMARY				Product	/Unit	Per Ton	millions	Per Lb	
RAW MATERIAL	s	Natural Gas	Gcal	6.320	21.93	138.58	38.06		
NAW MATERIAL	-0	Oxygen	ton	0.642	64.90	41.67	11.44		
		Catalysts & Chemicals	ton	1.000	04.30	0.70	0.19		
		Oddiysis a Oneimodis	TOTAL RAW MATERIAL		0.70	180.96	49.69	0.08	
	NFT RAW	MATERIALS	TOTAL NAME WATERIAL	.0		180.96	49.69	0.08	
UTILITIES	NEI ION	Power	MWh	0.004	57.36	0.25	0.07	0.00	
OTILITIES		Cooling Water	kton	0.057	29.04	1.67	0.46		
		Boiler Feed Water	ton	1.385	0.55	0.76	0.40		
		Steam (MP)	ton	(0.498)		(10.07)	(2.76)		
		Inert Gas	ton	0.067	52.60	3.50	0.96		
		Fuel	Gcal	0.382	21.93	8.38	2.30		
			TOTAL UTILITIES			4.49	1.23	0.00	
	NET RAW	/MATERIALS & UTILITIES				185.44	50.92	0.08	
	VARIABL	E COST				185.44	50.92	0.08	
DIRECT FIXED O	COSTS	Laborer	12 employees	48.23 Thousand	U.S. \$	2.11	0.58		
		Foremen	4 employees	54.74 Thousand	U.S. \$	0.80	0.22		
		Supervisor	1 employees	66.05 Thousand	U.S. \$	0.24	0.07		
		Maintenance, Material & Labor	. ,	3 % of ISBL		6.71	1.84		
		Direct Overhead		45 % Labor & Supervision		1.42	0.39		
			TOTAL DIRECT FIXED O			11.27	3.10	0.01	
ALLOCATED FIXED COSTS General Plant Overhead				60 % Direct Fixe	d Costs	6.76	1.86		
Insurance, Property Tax				1.5 % Total Plant	Capital	4.02	1.10		
•			TOTAL ALLOCATED FIXED COSTS			10.79	2.96	0.00	
	TOTAL F	IXED COSTS				22.06	6.06	0.01	
	TOTAL C	ASH COST				207.50	56.98	0.09	
	Depreciation @ COST OF PRODUCTION		10 % for ISBL & OPC	5	% for OSBL	31.30	8.60	0.01	
						238.80	65.58	0.11	
Return on Capital Employed (Incl. WC) @				10	Percent	36.89	10.13	0.02	
					-				
COST OF PRODUCTION + ROCE						275.70	75.71	0.13	

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Commercial Markets

Each TECH report also contains an overview of commercial applications and discussions of global and regional supply/demand/trade data (including historical, current estimate and forecast). Detailed plant capacity tables are provided detailing owning company, location and nameplate capacities for all plants in the regions analyzed.

4500 100% 90% 4000 80% 3500 70% 3000 **Thousand Tons** 60% 2500 50% 2000 40% 1500 30% 1000 20% 500 10% 0% 2013 2020 2014 2015 2016 2017 Consumption ——Capacity

Sample Regional Supply and Demand Balance

Why Subscribe?

Our TECH reports can be used by subscribers to:

- Understand business feasibility in project planning activities
- Obtain a third-party independent comparison of process economics of different technologies offered for license
- Recognize and assess investment opportunities for new products and innovative processes
- Identify commercially significant developments in their early stages, and place them in an economic context

A Subscription to TECH includes:

- PDF reports including detailed technology analyses, process economics, as well as commercial overviews and industry trends.
- Cost of production tables in spreadsheet format
- Support from our industry experts

A subscription to TECH includes twenty reports published in a given program year. Reports can also be purchased on an individual basis, including reports from previous program years.

NexantECA Subscriptions and Reports provide clients with comprehensive analytics, forecasts and insights for the chemicals, polymers, energy and cleantech industries. Using a combination of business and technical expertise, with deep and broad understanding of markets, technologies and economics, NexantECA provides solutions that our clients have relied upon for over 50 years.



Markets and Profitability comprises the former Petroleum and Petrochemical Economics (PPE), PolyOlefins Planning Service (POPS), Strategic Business Analysis (SBA) and World Gas Analytics (WGAS) and provides market analysis and profitability and pricing analysis with long term forecasts.

Contact us at Markets@NexantECA.com



Technology and Costs Technology and Costs comprises the Technoeconomics – Energy & Chemicals (TECH) program (formerly known as PERP), the Biorenewable Insights program (BI), the Sector Technology Analysis, and the Cost Curve Analysis. These programs provide comparative economics of different process routes and technologies in various geographic regions.

Contact us at Technology@NexantECA.com



The **Special Reports** analyse issues of topical importance to the energy and chemicals industry. Each special report explores the subject matter in detail to provide an up-to-date and thorough understanding of the related issue allowing investment decisions and new business strategy to be formulated.

Contact us at SpecialReports@NexantECA.com



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