

## 4. Chemicals

The chemical industry encompasses the production of basic organic and inorganic chemicals, synthetic rubber and fibers, pesticides and fertilizers, pharmaceuticals, paints and adhesives, soaps, and cleaning compounds. In the United States alone, the total value of shipments for the chemicals industry exceeded \$650 billion in 2006, and the industry provided almost 750,000 jobs.

### a) Representative Operation – Specialty Chemicals Manufacturing

The representative operation modeled is a smaller producer of specialty chemicals in limited volumes for niche markets, such as the production of industrial and consumer cleaning products, solvents, adhesives, and fragrances. As illustrated in Exhibit 3.14, this operation is characterized by:

- Modest land and building requirements
- Very significant initial machinery and equipment costs
- A workforce consisting almost entirely of professional and technical staff
- Significant raw material and inventory-carrying requirements

The business is assumed to operate as a stand-alone profit center.

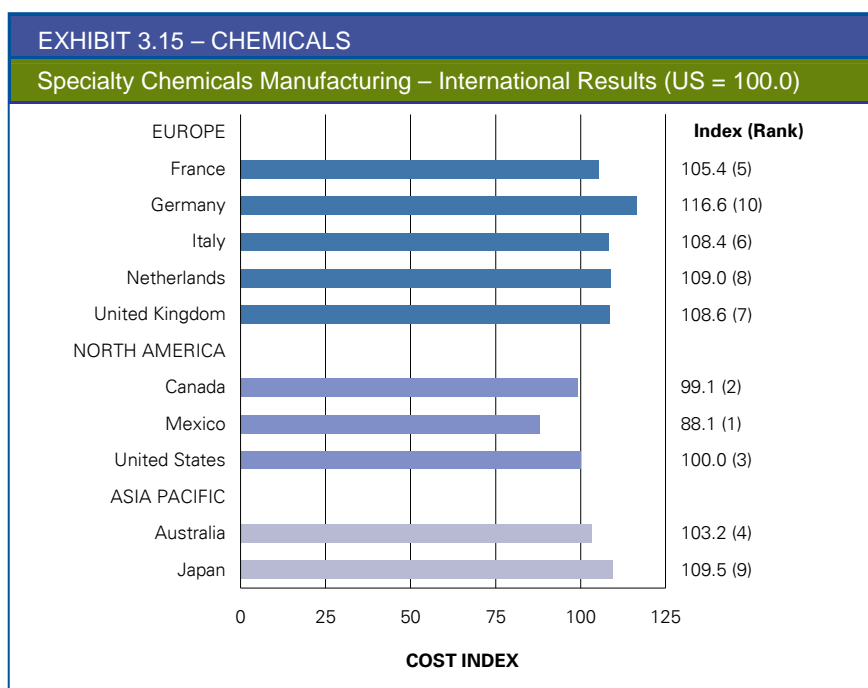
### b) International Results

International results are illustrated in Exhibit 3.15. These results reflect the combined impact of 27 location-sensitive cost components applied to the modeled operation. Detailed results, by key cost component, are presented in Exhibit 3.16.

### c) Leading Cities

Exhibit 3.17 profiles results for the leading (lower-cost) cities, by country, from among the 102 cities featured in this report. Results for all other featured cities can be found in Chapter 4, Exhibit 4.10.

EXHIBIT 3.14 – CHEMICALS	
Specialty Chemicals Manufacturing – Summary of Operating Parameters	
<b>Facilities Requirements</b>	
Industrial site purchased	5 acres (2 hectares)
Size of factory built	50,000 ft <sup>2</sup> (4,645 m <sup>2</sup> )
<b>Other Initial Investment Requirements</b>	
Machinery and equipment – US \$'000	\$14,000
Office equipment – US \$'000	\$500
R&D equipment – US \$'000	\$500
Inventory – US \$'000	\$5,000
Equity financing - % of project costs	40%
<b>Workforce</b>	
Management	5
Sales and administration	11
Customer support	5
Production/non-dedicated product development	
- Professional, technical	71
- Operators	2
- Unskilled laborers	4
Other	2
Total employees	100
<b>Energy Requirements</b>	
Electricity monthly consumption/peak demand	500,000 kWh and 1,800 kW
Gas monthly consumption	41,300 CCF (117,000 m <sup>3</sup> )
<b>Other Annual Operating Characteristics</b>	
Sales at full production – US \$'000	\$30,000
Materials and other direct costs - % of sales	43%
Other operating costs - % of sales	4.0%
Investment in tax-eligible R&D - % of sales	2.10%



## EXHIBIT 3.16 – CHEMICALS

## Specialty Chemicals Manufacturing – Costs, by Major Component, US \$'000

	Europe					North America			Asia Pacific	
	France	Germany	Italy	Netherlands	UK	Canada	Mexico	US	Australia	Japan
<b>Revenues</b>	28,950	28,950	28,950	28,950	28,950	28,950	28,950	28,950	28,950	28,950
<b>Costs</b>										
- Salaries & Wages	5,691	8,605	5,800	7,403	6,782	6,188	3,580	5,746	6,294	7,410
- Statutory Plans	2,397	1,308	1,865	853	806	467	455	487	817	700
- Other Benefits	1,144	1,809	1,643	2,417	2,074	1,319	751	1,600	1,485	2,191
- Total Labor & Benefits	9,232	11,722	9,308	10,673	9,662	7,973	4,786	7,833	8,594	10,301
- Transportation	97	107	134	102	101	137	128	125	103	82
- Utilities	1,356	1,915	2,020	1,465	1,503	940	1,158	846	1,343	1,688
- Interest & Depreciation	2,741	3,374	2,870	3,048	3,308	2,541	1,422	2,487	2,769	2,782
- Non-income Taxes	528	104	38	27	373	305	46	348	64	384
- Location-insensitive Costs	13,461	13,461	13,461	13,461	13,461	13,461	13,461	13,461	13,461	13,461
<b>Profit Before Income Tax</b>	1,535	(1,732)	1,119	354	543	3,594	7,949	3,862	2,616	253
- Income Taxes <sup>1</sup>	312	-	683	(115)	161	700	2,185	1,204	823	108
Effective Rate	20.3%	n/a	61.0%	18.6%	29.7%	19.5%	27.5%	31.5%	31.5%	42.8%
<b>After-tax Profit</b>	1,223	(1,732)	437	288	381	2,894	5,764	2,645	1,792	145
<b>Total Annual Costs</b>	27,728	30,682	28,513	28,661	28,569	26,057	23,186	26,304	27,157	28,805
<b>Index (US=100.0)</b>	<b>105.4</b>	<b>116.6</b>	<b>108.4</b>	<b>109.0</b>	<b>108.6</b>	<b>99.1</b>	<b>88.1</b>	<b>100.0</b>	<b>103.2</b>	<b>109.5</b>
<b>Rank</b>	<b>5</b>	<b>10</b>	<b>6</b>	<b>8</b>	<b>7</b>	<b>2</b>	<b>1</b>	<b>3</b>	<b>4</b>	<b>9</b>

<sup>1</sup> Income taxes may be either positive or negative, irrespective of whether profit before income tax is positive or negative, due to the impact of specific expense deduction rules, minimum taxes, and refundable income tax credits. Effective tax rates are not shown where results are not meaningful because of low profitability.

## EXHIBIT 3.17 – CHEMICALS

## Specialty Chemical Manufacturing – Results for Leading Cities, by Country

Country	City	Index	Rank Among 102 Cities	Country	City	Index	Rank Among 102 Cities
France	Toulouse	104.2	77	Canada	Sherbrooke	96.1	9
	Mulhouse	105.0	83		Moncton	96.5	12
Germany	Halle	113.5	99	Saskatoon	96.5	12	
	Erlangen	116.9	100	St. John's	96.6	14	
Italy	Vicenza	107.6	91	Mexico	Reynosa	86.6	1
	Livorno	108.6	92		Aguascalientes	88.0	2
Netherlands	Utrecht	109.0	93	United States	San Juan	94.3	6
United Kingdom	Barnsley	106.4	87		Shreveport	95.6	7
	Plymouth	106.6	88		McAllen	95.7	8
Australia	Adelaide	101.8	63		Oklahoma City	96.1	10
	Melbourne	101.9	66		Little Rock	96.3	11
Japan	Fukuoka	109.4	95		Lexington	96.9	17
	Yokohama	109.4	96		Montgomery	96.9	19
					Greenville-Spartanburg	97.0	20
			Cheyenne	97.3	22		