

## 10. Precision Manufacturing

**Precision manufacturing is a process-related concept, rather than being defined by specific industry definitions or products. Applications that require precision manufacturing exist in many industries and operations, including aerospace (aircraft parts and engines), R&D (laboratory and testing equipment), and automotive (auto engine parts), among others.**

### a) Representative Operation – Precision Component Manufacturing

The representative operation modeled is a small-volume manufacturer of high-value metal products with very low tolerance (e.g., a producer of precision components, casings, and housings). As illustrated in Exhibit 3.38, this operation is characterized by:

- Relatively small land and building requirements, and moderate equipment requirements
- A workforce consisting almost entirely of highly skilled operators
- Modest energy requirements
- High costs for materials, reflecting the high value of alloys used in production.

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

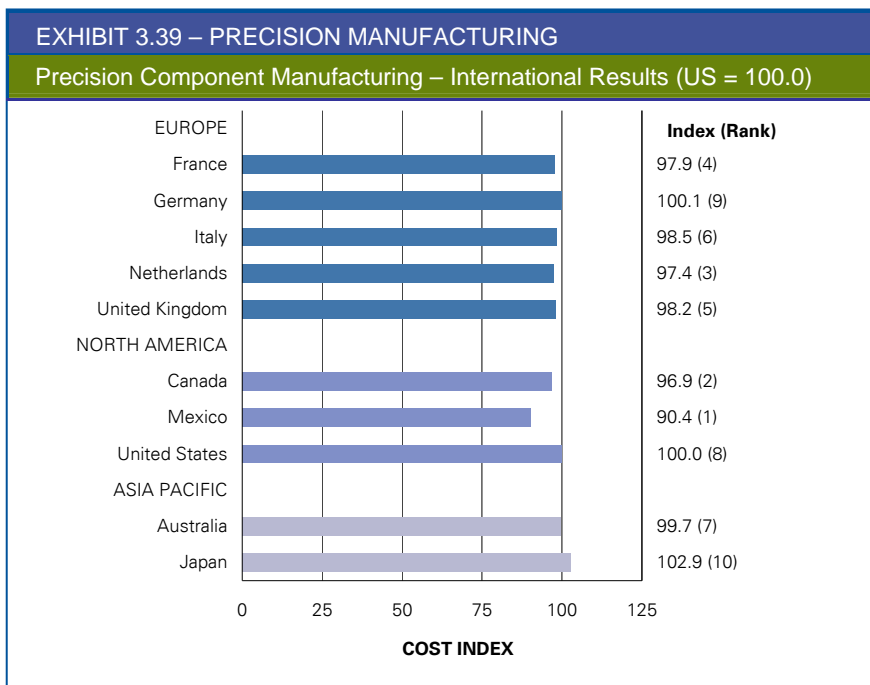
### b) International Results

International results are illustrated in Exhibit 3.39. These results reflect the combined impact of 26 location-sensitive cost components applied to the modeled operation. Detailed results, by key cost component, are presented in Exhibit 3.40.

### c) Selected Cities

Exhibit 3.41 profiles results for selected cities, by country, from among the 95 cities featured in this report. Results for all other featured cities can be found in Chapter 4, Exhibit 4.7.

EXHIBIT 3.38 – PRECISION MANUFACTURING	
Precision Component Manufacturing – Summary of Operating Parameters	
<b>Facilities Requirements</b>	
Leased industrial facility	2 acres (8,094 m2)
Size of factory built	30,000 ft2 (2,787 m2)
<b>Other Initial Investment Requirements</b>	
Machinery and equipment – US \$'000	\$14,800
Office equipment – US \$'000	\$200
R&D equipment – US \$'000	–
Inventory – US \$'000	\$2,400
Equity financing – % of project costs	50%
<b>Workforce</b>	
Management	3
Sales and administration	3
Production/non-dedicated product development	
- Professional, technical	4
- Operators	54
- Unskilled laborers	5
Other	1
Total employees	70
<b>Energy Requirements</b>	
Electricity monthly consumption/peak demand	150,000 kWh and 1,025 kW
Gas monthly consumption	7,500 CCF (21,246 m3)
<b>Other Annual Operating Characteristics</b>	
Sales at full production – US \$'000	\$31,000
Materials and other direct costs – % of sales	60%
Other operating costs – % of sales	2%
Investment in tax-eligible R&D – % of sales	1.3%



## EXHIBIT 3.40 – PRECISION MANUFACTURING

## Precision Component 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>	30,400	30,400	30,400	30,400	30,400	30,400	30,400	30,400	30,400	30,400
<b>Costs</b>										
- Salaries & Wages	3,270	4,484	3,522	3,966	3,667	3,759	1,479	3,840	3,920	5,018
- Statutory Plans	1,491	783	762	528	347	392	97	417	500	479
- Other Benefits	686	956	1,017	1,060	1,234	961	434	1,492	842	1,269
- Total Labor & Benefits	5,447	6,224	5,301	5,554	5,247	5,112	2,011	5,749	5,262	6,766
- Facility Lease	205	256	246	273	418	160	145	152	215	475
- Transportation	1,012	880	1,095	918	916	1,536	2,011	1,442	2,151	865
- Utilities	369	500	731	469	467	286	252	293	361	474
- Interest & Depreciation	2,470	2,537	2,490	2,475	2,534	2,459	2,123	2,489	2,384	2,557
- Non-Income Taxes	363	89	20	18	259	143	34	320	53	454
- Location-Insensitive Costs	18,848	18,848	18,848	18,848	18,848	18,848	18,848	18,848	18,848	18,848
<b>Profit Before Income Tax</b>	1,688	1,068	1,670	1,846	1,711	1,858	4,978	1,109	1,128	(39)
- Income Taxes <sup>1</sup>	274	309	432	288	380	165	1,348	321	242	36
Effective Rate	16.2%	28.9%	25.9%	15.6%	22.2%	8.9%	27.1%	28.9%	21.5%	n/a
<b>After-Tax Profit</b>	1,414	760	1,237	1,558	1,331	1,694	3,630	788	885	(75)
<b>Total Annual Costs</b>	28,987	29,641	29,163	28,842	29,070	28,708	26,771	29,613	29,514	30,474
<b>Index (US=100.0)</b>	<b>97.9</b>	<b>100.1</b>	<b>98.5</b>	<b>97.4</b>	<b>98.2</b>	<b>96.9</b>	<b>90.4</b>	<b>100.0</b>	<b>99.7</b>	<b>102.9</b>
<b>Rank</b>	<b>4</b>	<b>9</b>	<b>6</b>	<b>3</b>	<b>5</b>	<b>2</b>	<b>1</b>	<b>8</b>	<b>7</b>	<b>10</b>

1 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 3.41 – PRECISION MANUFACTURING

## Precision Component Manufacturing – Results for Selected Cities, by Country

Country and City	Index	Rank <sup>1</sup>	Country and City	Index	Rank <sup>1</sup>	Country and City	Index	Rank <sup>1</sup>
<b>International Locations – All Cities</b>						<b>North America – Lowest Cost Cities</b>		
<b>AU</b> Adelaide	99.7	71	<b>JP</b> Osaka	102.4	91	<b>CA</b> Moncton, NB	95.7	3
Brisbane	99.8	73	Tokyo	103.4	93	Sherbrooke, QC	95.7	4
Melbourne	99.2	58			Fredericton, NB	96.1	5	
Sydney	100.2	77	<b>MX</b> Mexico City	91.0	2	Quebec City, QC	96.3	6
			Monterrey	89.8	1			
<b>FR</b> Lyon	97.9	27			<b>US</b> Youngstown, OH	97.2	11	
Paris	97.9	28	<b>NL</b> Amsterdam	97.3	14	Charleston, WV	97.3	13
			Brabant Stad	97.4	18	Shreveport, LA	97.3	17
<b>GE</b> Berlin	99.6	70	The Hague	97.5	20	Greenville-Spartanburg, SC	97.6	23
Frankfurt	100.5	83	Utrecht	97.5	19	Lexington, KY	97.6	24
					Buffalo, NY	97.7	25	
<b>IT</b> Milan	98.3	38	<b>UK</b> London	99.4	65	Atlanta, GA	97.8	26
Rome	98.7	45	Manchester	96.9	9	Tampa, FL	97.9	29

1 Rank among 95 cities.