

Workforce Demands in the Oil & Gas Industry: Upstream Manufacturing

Workforce Solutions

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**Workforce Solutions is an affiliate of the Gulf Coast Workforce Board, which manages a regional workforce system that helps employers solve their workforce problems and residents build careers so both can compete in the global economy. The workforce system serves the City of Houston and the surrounding 13 Texas Gulf Coast counties including: Austin, Brazoria, Chambers, Colorado, Fort Bend, Galveston, Harris Liberty, Matagorda, Montgomery, Walker, Waller, and Wharton*

This report is the second in a series providing an overview on the state of the oil and gas industry in the Gulf Coast including a brief look at immediate and long-term challenges.

An Overview of Manufacturing Related to Oil & Gas

It is widely known that the economy of the Gulf Coast Region is largely centered on the energy industry with roughly half of all jobs tied to it in some way. A key industry critical to oil and gas production lies in manufacturing. This can take several forms ranging from the production of specialized equipment needed to extract crude oil and natural gas, to pipelines and storage facilities, to the refining of petroleum products for fuels, chemicals, plastics and more.

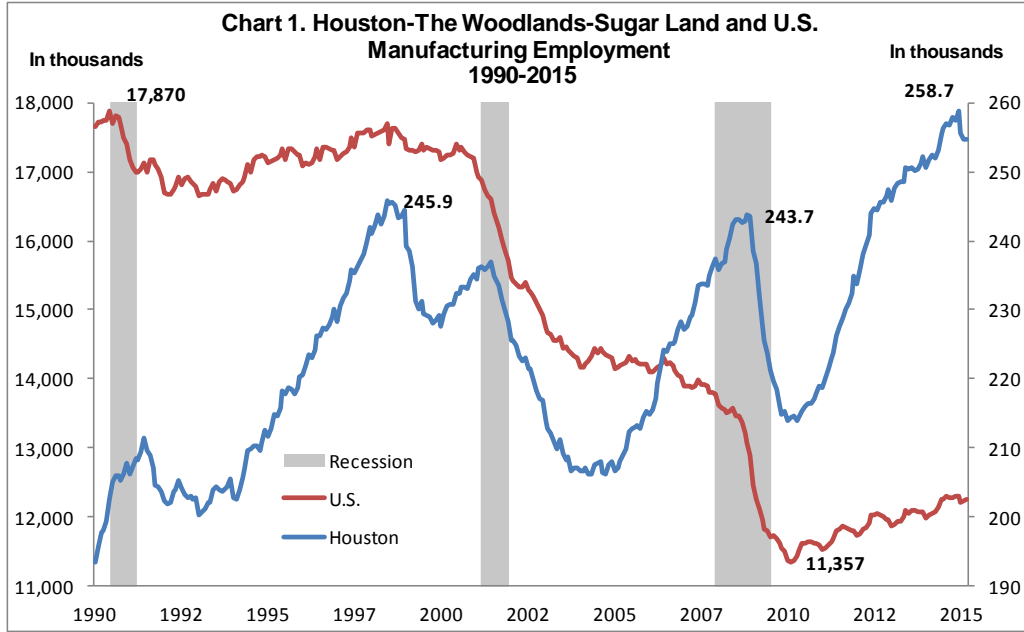
These different types of manufacturing roughly correspond to the three major segments of the oil and gas industry:

- Upstream – the exploration, production, and extraction of oil and gas
- Midstream – the transportation, storage, and wholesale marketing of crude or refined petroleum products
- Downstream – the oil and gas operations that take place after production and up to the point of sale

This report will focus on manufacturing related to upstream oil and gas given the relatively large number of manufacturing sub-industries in this segment and their outsized contribution to the overall sector's employment.

Manufacturing Employment: Past, Present, and Future

As of March 2015, manufacturing in the Gulf Coast Region employed approximately 255,000 people, or roughly 9 percent of total employment. Whereas the neither the U.S. nor Texas have seen their manufacturing employment rise above their peaks recorded in the mid-1970s and late-1990s, respectively, Houston registered its all-time high just recently in December of 2014 with nearly 259,000 jobs. This surpassed the previous peaks in mid-1997 and late-2008 by around 15,000 jobs (see chart 1). In short, Houston's manufacturing sector has demonstrated a degree of resilience after each downturn rarely seen across other major metropolitan areas or states.

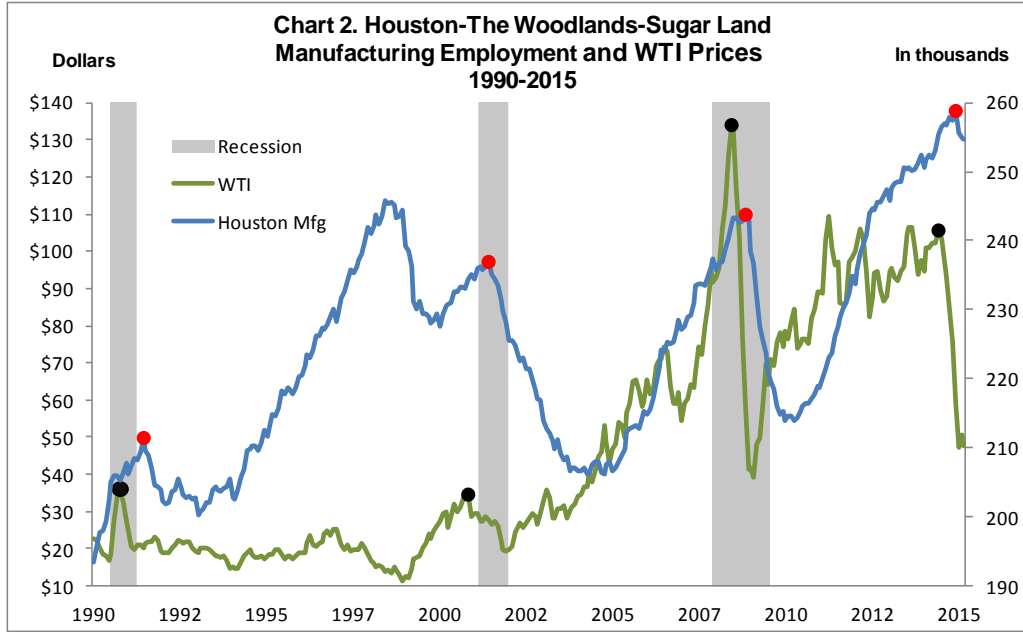


Source: BLS/TWC – Current Employment Statistics (CES)

While manufacturing employment in the Gulf Coast has shown a tendency to rise over time in contrast to other regions, its fortunes remain largely tied to the price of oil. This can be seen in Chart 2, which shows that a peak in oil prices has often been followed by a peak in manufacturing employment approximately six to eight months later. As a result, there is a strong likelihood that we have seen peak employment in manufacturing for this economic cycle. Furthermore it suggests that steepest declines in manufacturing jobs may occur towards the latter half of 2015. The section below details historical peaks in the price of West Texas Intermediate and Houston-area manufacturing employment from 1990 to present.

- WTI peaks in Oct 1990 followed by manufacturing in June 1991.
- WTI prices peaks in November 2000 followed by manufacturing in June 2001.
- WTI peaks in June 2008 followed manufacturing in November 2008.
- WTI peaks in June 2014 followed by manufacturing in December 2014?

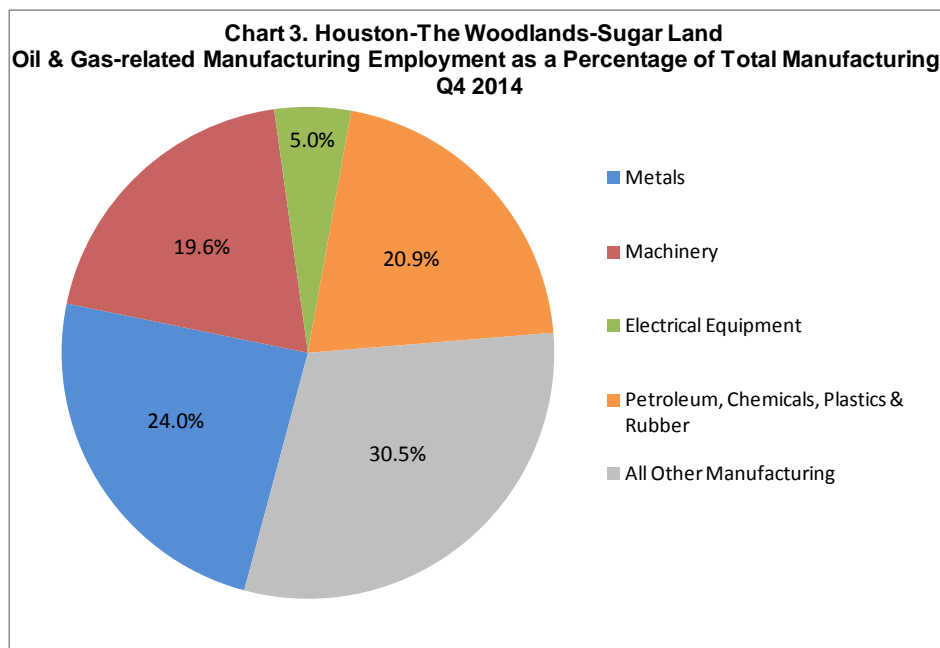
The first three peaks and subsequent declines all coincide with national recessions as determined by the National Bureau of Economic Research (NBER) to varying degrees. This does not necessary imply that the U.S. is currently in a recession. However it should be noted that due to the lag across various economic data, the NBER can make such determinations as much as a year after downturns have begun or ended. Nevertheless the Gulf Coast manufacturing sector remains expected to grow, albeit slightly slower than average (22.8 percent vs. 23.8 percent for all industries) based on long-term employment projections for an additional 56,000 jobs by 2022.



Source: BLS/TWC – Current Employment Statistics (CES) and Energy Information Administration

Upstream Manufacturing Sub-industries

As noted, manufacturing in the Gulf Coast remains highly dependent on the oil and gas industry, particularly as source of demand for extraction equipment and as a supplier of feedstock to produce various petroleum-based products. Examining sub-industries at the four-digit NAICS level reveals four types of manufacturing with the strongest relationship to oil and gas (see Chart 3): **metals, machinery, electrical equipment, and petroleum products, chemicals, plastics, and rubber.**



Source: BLS/TWC – Quarter Census of Employment and Wages (QCEW)

These four groups comprise nearly 70 percent of all manufacturing employment in the Gulf Coast region. Furthermore, the upstream portion consisting of metals, machinery, and electrical equipment, comprises almost 50 percent of manufacturing jobs. Note that numerous other manufacturing sub-industries with a less obvious connection to oil and gas are also likely to provide goods and services to this industry. Hence the estimates included in this report may understate the full extent to which Gulf Coast manufacturing relies on oil and gas. The following sections provide brief descriptions of these upstream manufacturing groups along with their long-term outlooks.

Metals

This group, which accounts for nearly one-quarter of all manufacturing jobs in the region, includes industries that engage in activities ranging from die forging to machine shops that fabricate or modify raw metal products by rolling, bending, and shaping. Products from these industries include basic structural components used in oil and gas production, construction, and even maritime industries. As of the fourth quarter of 2014 there were over 62,000 jobs in these industries. Despite the current regional economic downturn, metal-related industries are expected to grow faster than average by the year 2022, up 29 percent or 16,000 jobs. (See appendix for the seven sub-industries in this category).

Machinery

This group is composed of two sub-industries: **Agriculture, Construction, and Mining Machinery Manufacturing**, and **Other General Purpose Machinery Manufacturing**. The former industry includes firms engaged in the manufacture of oil and gas field equipment such as drilling machinery, production equipment such as pump jacks, and structural equipment such as derricks. Agriculture, Construction, and Mining Machinery Manufacturing alone provides 44,000 jobs to the region and is the single-largest sub-industry within the overall manufacturing sector. Other General Purpose Machinery Manufacturing comprises a broad range of industrial products not always specific to, but frequently used in oil and gas production and exploration due to the industry's concentration in the Gulf Coast. Overall projected growth between these two sub-industries is expected to be particularly robust at 33 percent for an increase of 15,000 jobs over the decade.

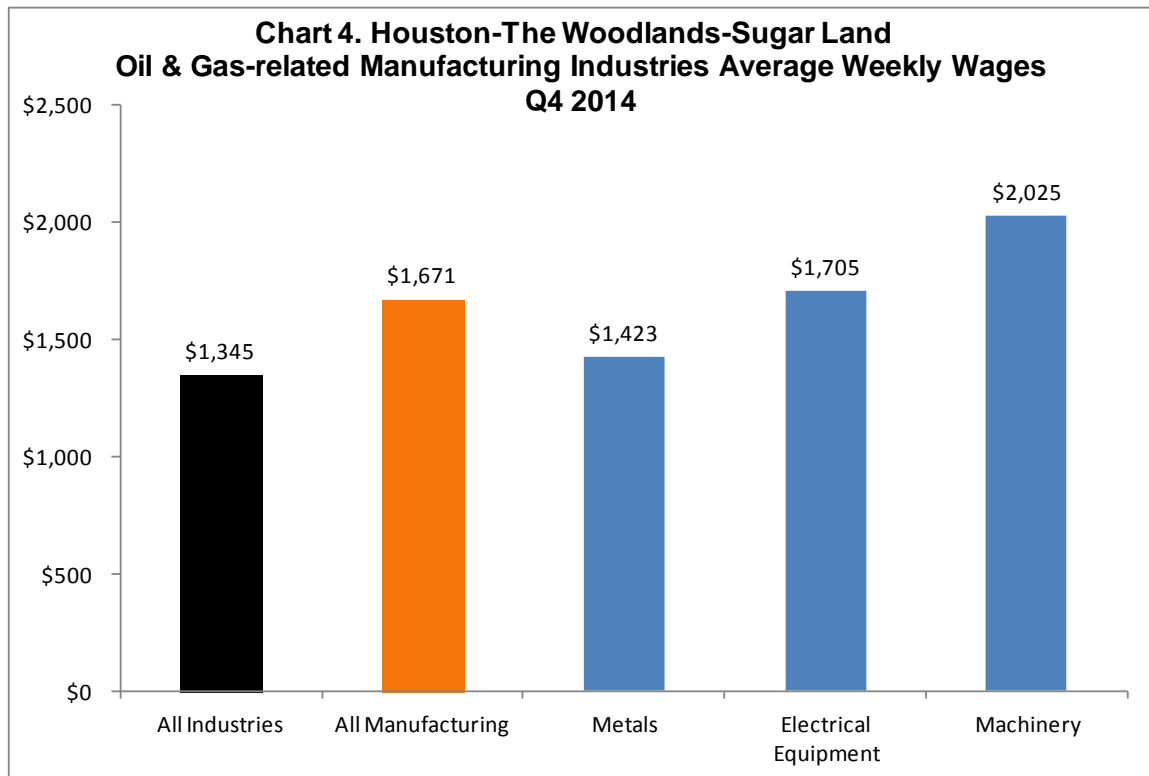
Electrical Equipment

The smallest of the three upstream manufacturing groups, Electrical Equipment is composed of **Electrical Equipment Manufacturing** as well as **Electronic Instrument Manufacturing**. While not limited to the oil and gas industry, Electrical Equipment Manufacturing produces power generation equipment and motor control systems critical to maintaining constant operation at oil field sites that are often times geographically remote. Electronic Instrument Manufacturing provides control and monitoring equipment

integral to regulating oil and gas production that also incorporates warning systems to enhance worker safety. Combined, these sub-industries provide 12,000 jobs across the Gulf Coast and are expected to add 3,300 jobs between 2012 and 2022.

Wages

Despite near-term challenges in light of low oil prices, the manufacturing sector can provide above average wages to those with the right skills. At \$1,671 per week, manufacturing wages in the region were 24 percent above the average for all industries (\$1,345) as of fourth quarter 2014. Drilling down further to the upstream manufacturing groups outlined earlier revealed that two out of three yielded wages above the average for overall manufacturing. Machinery manufacturing providing the highest average weekly wage at \$2,024, followed by electrical (\$1,705), and metals (\$1,422). (See Chart 4.)

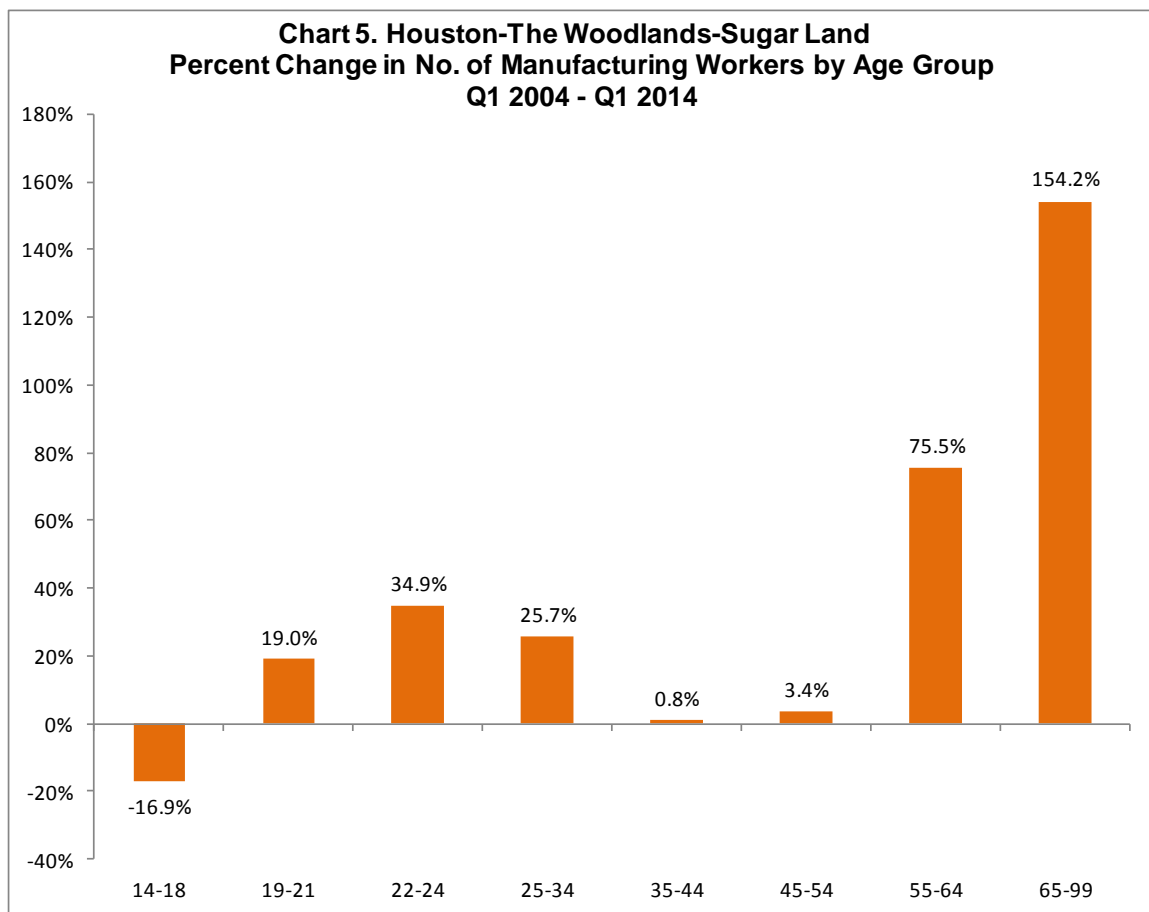


Source: BLS/TWC – Quarterly Census of Employment and Wages (QCEW)

Demographic Challenges

An Aging Workforce

Similar to the construction and mining sectors highlighted in previous reports, the manufacturing sector, including the portions affiliated with oil and gas, faces the challenge of an aging workforce. Chart 5 shows that between Q1 2004 and Q1 2014, the fastest growing age groups in Gulf Coast manufacturing were those aged 55-64 and 65 and over, up 76 percent and 154 percent, respectively. Perhaps even more concerning was the anemic growth in the number of workers aged 35-44 and 45-54, up 0.8 percent and 3.4 percent, over this same period. This suggests a possible dearth of future senior talent in the coming years as the two oldest cohorts transition from the workforce to retirement. On a positive note, growth among manufacturing workers aged 19 to 34 may provide a boost to the future cohort of workers aged 35-54 based on respectable growth of 19 percent to 35 percent.



Source: Census – Quarterly Workforce Indicators (QWI)

Appendix A

Gulf Coast Employment Projections - Oil & Gas-related Manufacturing Industries 2012-2022

		Average Annual Employment		Net Chg	Pct Chg
		2012	2022		
Manufacturing		247,520	304,000	56,480	22.8%
Machinery	Ag., construction, and mining machinery mfg.	40,750	54,810	14,060	34.5%
	Other general purpose machinery manufacturing	5,870	7,120	1,250	21.3%
		46,620	61,930	15,310	32.8%
Other fabricated metal product manufacturing		14,920	20,160	5,240	35.1%
Machine shops and threaded product mfg.		12,170	15,250	3,080	25.3%
Architectural and structural metals mfg.		14,540	18,220	3,680	25.3%
Metals	Coating, engraving, and heat treating metals	6,820	8,830	2,010	29.5%
	Steel product mfg. from purchased steel	2,100	2,690	590	28.1%
	Forging and stamping	2,590	3,250	660	25.5%
	Iron and steel mills and ferroalloy mfg.	1,280	1,690	410	32.0%
			54,420	70,090	15,670
Basic chemical manufacturing		20,810	24,250	3,440	16.5%
Petroleum, Chemical, Plastics, Rubber	Petroleum and coal products manufacturing	12,200	14,210	2,010	16.5%
	Plastics product manufacturing	9,510	11,910	2,400	25.2%
	Other chemical product and preparation mfg.	4,320	5,290	970	22.5%
	Resin, rubber, and artificial fibers mfg.	3,930	4,110	180	4.6%
	Rubber product manufacturing	1,430	1,790	360	25.2%
	Paint, coating, and adhesive manufacturing	2,380	2,770	390	16.4%
		54,580	64,330	9,750	17.9%
Electronic instrument manufacturing		7,470	9,360	1,890	25.3%
Electrical	Electrical equipment manufacturing	4,510	5,900	1,390	30.8%
			11,980	15,260	3,280

Appendix B

Gulf Coast Employment Projections - Production Occupations within Oil & Gas-related Manufacturing Industries 2012-2022

SOC	Occupation	Average Annual		Net Chg	Pct Chg
		2012	2022		
51-4041	Machinists	3,090	4,470	1,380	44.7%
51-4121	Welders, Cutters, Solderers, and Brazers	3,300	4,330	1,030	31.2%
51-2092	Team Assemblers	2,350	3,080	730	31.1%
51-9061	Inspectors, Testers, Sorters, Samplers, & Weighers	1,640	2,180	540	32.9%
51-1011	First-Line Supervisors of Production & Operating Workers	1,270	1,660	390	30.7%
51-4122	Welding, Soldering, and Brazing Machine Setters, Operators, and Tenders	670	1,060	390	58.2%
51-4011	Computer-Controlled Machine Tool Operators, Metal/Plastic	580	930	350	60.3%
51-2031	Engine & Other Machine Assemblers	920	1,220	300	32.6%
51-9198	Helpers--Production Workers	930	1,220	290	31.2%
51-9121	Coating, Painting, & Spraying Machine Setters, Operators, & Tenders	690	910	220	31.9%
51-2041	Structural Metal Fabricators & Fitters	620	800	180	29.0%
51-2023	Electromechanical Equipment Assemblers	540	710	170	31.5%
Machinery 51-4035	Milling & Planing Machine Setters, Operators, & Tenders, Metal/Plastic	800	960	160	20.0%
51-2022	Electrical & Electronic Equipment Assemblers	460	620	160	34.8%
51-4034	Lathe & Turning Machine Tool Setters, Operators, & Tenders, Metal/Plastic	680	810	130	19.1%
51-4012	Computer Numerically Controlled Machine Tool Programmers, Metal/Plastic	190	300	110	57.9%
51-4031	Cutting, Punching, & Press Machine Setters, Operators, & Tenders, Metal/Plastic	520	620	100	19.2%
51-4033	Grinding, Lapping, Polishing, & Buffing Machine Tool Setters, Operators, & Tenders, Metal/Plastic	230	280	50	21.7%
51-4111	Tool and Die Makers	110	150	40	36.4%
51-4194	Tool Grinders, Filers, and Sharpeners	40	60	20	50.0%
51-4081	Multiple Machine Tool Setters, Operators, and Tenders, Metal and Plastic	140	150	10	7.1%
51-4072	Molding, Coremaking, and Casting Machine Setters, Operators, and Tenders, Metal and Plastic	20	30	10	50.0%
51-9122	Painters, Transportation Equipment	40	50	10	25.0%
51-4199	Metal Workers and Plastic Workers, All Other	20	20	0	0.0%
51-4032	Drilling & Boring Machine Tool Setters, Operators, & Tenders, Metal/Plastic	40	30	-10	-25.0%
		19,890	26,650	6,760	34.0%

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**Gulf Coast Employment Projections - Production Occupations within Oil & Gas-related Manufacturing Industries
2012-2022, Cont'd**

SOC	2012	2022	Net Chg	Pct Chg
51-4041 Machinists	5,220	7,160	1,940	37.2%
51-4011 Computer-Controlled Machine Tool Operators, Metal/Plastic	1,910	2,860	950	49.7%
51-4121 Welders, Cutters, Solderers, and Brazers	2,790	3,570	780	28.0%
51-1011 First-Line Supervisors of Production & Operating Workers	2,380	3,080	700	29.4%
51-9061 Inspectors, Testers, Sorters, Samplers, & Weighers	2,340	3,020	680	29.1%
51-9198 Helpers--Production Workers	1,870	2,400	530	28.3%
51-9121 Coating, Painting, & Spraying Machine Setters, Operators, & Tenders	1,170	1,570	400	34.2%
51-2092 Team Assemblers	1,160	1,510	350	30.2%
51-2041 Structural Metal Fabricators & Fitters	1,190	1,520	330	27.7%
51-4031 Cutting, Punching, & Press Machine Setters, Operators, & Tenders, Metal/Plastic	1,930	2,210	280	14.5%
51-4034 Lathe & Turning Machine Tool Setters, Operators, & Tenders, Metal/Plastic	1,440	1,670	230	16.0%
51-4191 Heat Treating Equipment Setters, Operators, and Tenders, Metal and Plastic	630	830	200	31.7%
51-4193 Plating and Coating Machine Setters, Operators, and Tenders, Metal and Plastic	1,040	1,230	190	18.3%
51-4012 Computer Numerically Controlled Machine Tool Programmers, Metal/Plastic	280	460	180	64.3%
51-4033 Grinding, Lapping, Polishing, & Buffing Machine Tool Setters, Operators, & Tenders, Metal/Plastic	920	1,040	120	13.0%
51-4122 Welding, Soldering, and Brazing Machine Setters, Operators, and Tenders	180	280	100	55.6%
51-9022 Grinding & Polishing Workers, Hand	270	360	90	33.3%
Metals 51-4021 Extruding & Drawing Machine Setters, Operators, & Tenders, Metal/Plastic	470	540	70	14.9%
51-4081 Multiple Machine Tool Setters, Operators, and Tenders, Metal and Plastic	500	570	70	14.0%
51-4192 Layout Workers, Metal and Plastic	250	320	70	28.0%
51-2022 Electrical & Electronic Equipment Assemblers	210	280	70	33.3%
51-4111 Tool and Die Makers	120	170	50	41.7%
51-4022 Forging Machine Setters, Operators, & Tenders, Metal/Plastic	350	390	40	11.4%
51-4023 Rolling Machine Setters, Operators, & Tenders, Metal/Plastic	240	280	40	16.7%
51-4072 Molding, Coremaking, and Casting Machine Setters, Operators, and Tenders, Metal and Plastic	250	290	40	16.0%
51-2099 Assemblers & Fabricators, All Other	90	130	40	44.4%
51-9199 Production Workers, All Other	100	140	40	40.0%
51-9111 Packaging & Filling Machine Operators & Tenders	80	110	30	37.5%
51-4035 Milling & Planing Machine Setters, Operators, & Tenders, Metal/Plastic	200	220	20	10.0%
51-9192 Cleaning, Washing, & Metal Pickling Equipment Operators & Tenders	100	120	20	20.0%
51-4194 Tool Grinders, Filers, and Sharpeners	30	40	10	33.3%
51-4199 Metal Workers and Plastic Workers, All Other	60	60	0	0.0%
51-4051 Metal-Refining Furnace Operators & Tenders	10	10	0	0.0%
51-7042 Woodworking Machine Setters, Operators, & Tenders, Ex. Sawing	20	20	0	0.0%
51-4032 Drilling & Boring Machine Tool Setters, Operators, & Tenders, Metal/Plastic	160	150	-10	-6.3%
	29,960	38,610	8,650	28.9%

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**Gulf Coast Employment Projections - Production Occupations within Oil & Gas-related Manufacturing Industries
2012-2022, Cont'd**

SOC	2012	2022	Net Chg	Pct Chg
51-1011 First-Line Supervisors of Production & Operating Workers	4,600	5,300	700	15.2%
51-2092 Team Assemblers	3,460	4,030	570	16.5%
51-4041 Machinists	3,330	3,860	530	15.9%
51-8091 Chemical Plant & System Operators	3,010	3,410	400	13.3%
51-8093 Petroleum Pump System Operators, Refinery Operators, & Gaugers	1,050	1,350	300	28.6%
51-8099 Plant and System Operators, All Other	1,280	1,490	210	16.4%
51-9011 Chemical Equipment Operators & Tenders	510	660	150	29.4%
51-9012 Separating, Filtering, Clarifying, Precipitating, & Still Machine Setters, Operators, & Tenders	700	840	140	20.0%
51-9023 Mixing & Blending Machine Setters, Operators, & Tenders	220	340	120	54.5%
51-9061 Inspectors, Testers, Sorters, Samplers, & Weighers	660	750	90	13.6%
51-9111 Packaging & Filling Machine Operators & Tenders	450	520	70	15.6%
Petroleum 51-4121 Welders, Cutters, Solderers, and Brazers	420	480	60	14.3%
, Chemical, 51-9198 Helpers--Production Workers	240	300	60	25.0%
Plastics, 51-9041 Extruding, Forming, Pressing, & Compacting Machine Setters, Operators, & Tenders	420	460	40	9.5%
Rubber 51-9121 Coating, Painting, & Spraying Machine Setters, Operators, & Tenders	110	130	20	18.2%
51-2091 Fiberglass Laminators & Fabricators	50	70	20	40.0%
51-4011 Computer-Controlled Machine Tool Operators, Metal/Plastic	30	40	10	33.3%
51-4021 Extruding & Drawing Machine Setters, Operators, & Tenders, Metal/Plastic	50	60	10	20.0%
51-4032 Drilling & Boring Machine Tool Setters, Operators, & Tenders, Metal/Plastic	10	20	10	100.0%
51-4033 Grinding, Lapping, Polishing, & Buffing Machine Tool Setters, Operators, & Tenders, Metal/Plastic	10	20	10	100.0%
51-4081 Multiple Machine Tool Setters, Operators, and Tenders, Metal and Plastic	70	80	10	14.3%
51-4111 Tool and Die Makers	90	100	10	11.1%
51-4199 Metal Workers and Plastic Workers, All Other	30	40	10	33.3%
51-9022 Grinding & Polishing Workers, Hand	60	70	10	16.7%
51-9031 Cutters & Trimmers, Hand	40	40	0	0.0%
51-9197 Tire Builders	10	10	0	0.0%
	20,910	24,470	3,560	17.0%

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**Gulf Coast Employment Projections - Production Occupations within Oil & Gas-related Manufacturing Industries
2012-2022, Cont'd**

SOC		2012	2022	Net Chg	Pct Chg
Electrical Equipment	51-1011 First-Line Supervisors of Production & Operating Workers	1030	1300	270	26.2%
	51-2092 Team Assemblers	480	590	110	22.9%
	51-4041 Machinists	360	450	90	25.0%
	51-9061 Inspectors, Testers, Sorters, Samplers, & Weighers	260	330	70	26.9%
	51-4121 Welders, Cutters, Solderers, and Brazers	310	380	70	22.6%
	51-9198 Helpers--Production Workers	200	270	70	35.0%
	51-9121 Coating, Painting, & Spraying Machine Setters, Operators, & Tenders	150	210	60	40.0%
	51-4011 Computer-Controlled Machine Tool Operators, Metal/Plastic	150	200	50	33.3%
	51-4081 Multiple Machine Tool Setters, Operators, and Tenders, Metal and Plastic	80	100	20	25.0%
	51-4031 Cutting, Punching, & Press Machine Setters, Operators, & Tenders, Metal/Plastic	60	70	10	16.7%
	51-4072 Molding, Coremaking, and Casting Machine Setters, Operators, and Tenders, Metal and Plastic	40	50	10	25.0%
	51-2022 Electrical & Electronic Equipment Assemblers	80	90	10	12.5%
	51-2099 Assemblers & Fabricators, All Other	20	30	10	50.0%
	51-2023 Electromechanical Equipment Assemblers	10	10	0	0.0%
	51-2021 Coil Winders, Tapers, & Finishers	10	10	0	0.0%
		3240	4090	850	26.2%