Energy Trends in Selected Manufacturing Sectors:

Opportunities and Challenges for Environmentally Preferable Energy Outcomes








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Prepared for:
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Prepared by:
ICF International
9300 Lee Highway
Fairfax, VA 22031
(703) 934-3000

3.10 Motor Vehicle Parts Manufacturing

Recent Sector Trends Informing the Base Case

Number of facilities: ↓
Value of shipments: ↓
Electricity intensity: ↑

Major fuel sources: Electricity, natural gas

Current economic and energy consumption data are summarized in Table 50.

3.10.1 Base Case Scenario

Situation Assessment

The motor vehicle parts manufacturing sector (NAICS 3363) encompasses a diverse set of firms that manufacture finished parts used in the assembly of automobiles, ranging from firms that manufacture components such as gasoline engines, transmissions, and steering and brake systems, to those that manufacture electrical and electronic equipment, to those that produce interior seating and trimmings.[268] Original equipment manufacturers (OEMs) produce the equipment parts used in the assembly of new vehicles. The industry is highly fragmented, consisting of thousands of independent companies across the United States. According to the U.S. Census Bureau, there were more than 5,700 establishments in this NAICS in 2002, a decline from 5,800 in 1997. The industry experienced no growth in value added and a small decline in value of shipments from 1997 to 2004 (see Table 50).

According to the Automotive Parts Manufacturers' Association (APMA) of Canada, natural gas meets approximately half of sector energy demand, with electricity meeting approximately 20 percent and petroleum-based fuels meeting approximately 10 percent of demand.[269] For the U.S. industry, the electricity fraction may be higher based on energy cost data compiled by the Census Bureau. From 1998 to 2004, electricity purchases ranged from 69 to 75 percent of total energy costs for the industry, representing smaller fractions in 2003 and 2004 as petroleum and natural gas prices increased.[270]

Since Census Bureau data from the *Annual Survey of Manufacturers* do not provide the annual amount of energy produced from purchased fuels, it is not possible to calculate the total energy intensity of the motor vehicle parts manufacturing industry, though it is possible to calculate electric intensity (kWh/dollar value of shipments). Electric intensity increased by 3 percent from 1998 to 2004. Total electricity consumption increased 14 percent from 1998 to 2004.[271]

Due to the diversity of the automotive parts manufacturing industry, there are a wide array of processes associated with sector energy use, including assembly (18 percent of total energy usage), plastics molding (16 percent), and surface coating and painting (13 percent). [272] Energy costs generally represent less than 10 percent of total production costs for the industry.[273]

Table 50 summarizes current economic trend and energy consumption data originally presented in Chapter 2.

Table 50: Current economic and energy data for the motor vehicle parts manufacturing industry

Economic Production Trends				
	Annual Change in Value Added 1997-2004	Annual Change in Value Added 2000-2004	Annual Change in Value of Shipments 1997-2004	Annual Change in Value of Shipments 2000-2004
	0.0%	-2.2%	-0.1%	-2.3%

Energy Intensity in 2002				
	Energy Consumption per Dollar of Value Added (thousand Btu)	Energy Consumption per Dollar Value of Shipments (thousand Btu)	Energy Cost per Dollar of Value Added (share)	Energy Cost per Dollar Value of Shipments (share)
	NA	NA	2.1%	0.9%
Primary Fuel Inputs as Fraction of Total Energy Supply in 2002 (fuel use only)[llll]				
		Natural Gas	Net Electricity	Other[mmmm]
		48%	41%	7%
Fuel-Switching Potential in 2002: Natural Gas to Alternate Fuels				
			Switchable fraction of natural gas inputs	18%
		Fuel Oil	LPG	Coal
Fraction of natural gas inputs that could be met by alternate fuels		50%	42%	11%
Fuel-Switching Potential in 2002: Coal to Alternate Fuels				
			Switchable fraction of coal inputs	Withheld
		Natural Gas	Fuel Oil	Electricity
Fraction of coal inputs that could be met by alternate fuels		94%	14%	4%

Expected Future Trends

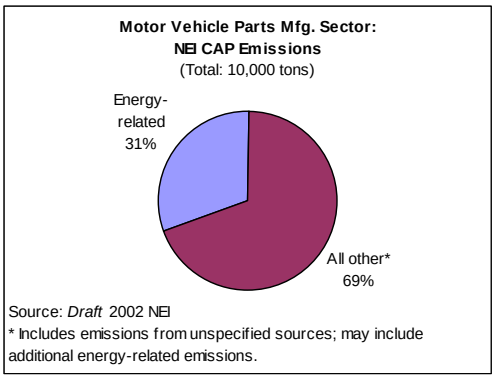
Though no energy projections are available for the motor vehicle parts manufacturing industry, recent trends suggest that electricity consumption is growing relative to the value of economic output. Increases in electricity intensity suggest that controlling energy costs in a volatile fuel market has not motivated the industry toward increased energy efficiency investment to a notable degree. The available data for this sector suggest a slow rate of energy efficiency improvement in future, primarily through replacement of aging equipment with newer technologies. No fuel-switching trend is expected.

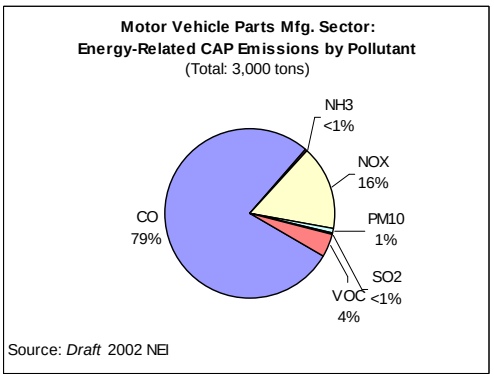
[llll] Fuel input and fuel-switching data are for the larger NAICS category, transportation equipment (NAICS 336).

[mmmm] Within MECS, the largest fractions of the "other" category include still gas and waste gas, asphalt and road oil, petroleum coke, and purchased steam.

Environmental Implications

Figure 24: Motor vehicle parts manufacturing sector: energy-related CAP emissions





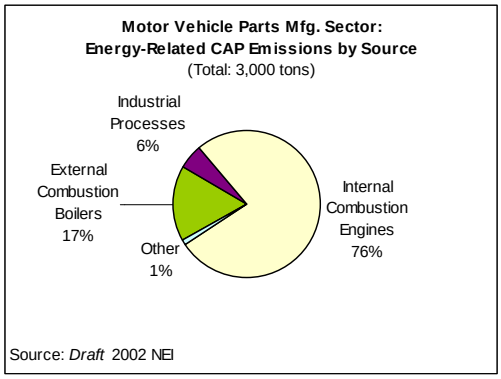
Effects of Energy-Related CAP Emissions

NO_x emissions contribute to respiratory illness and may cause lung damage. NO_x emissions also contribute to acid rain, ground-level ozone, and reduced visibility.

Figure 24 compares NEI data on energy-related CAP emissions with total CAP emissions for the motor vehicle parts manufacturing industry. As purchased electricity meets a substantial fraction of this sector's energy needs, it is important to note that NEI data attribute emissions to the generating source rather than the purchasing entity. Thus, NEI data underestimate energy-related emissions for this sector. However, the sector is a relatively minor source of onsite energy-related CAP emissions compared with other sectors considered in this analysis—approximately 3,000 tons per year compared with more than 700,000 tons per year for the chemical manufacturing industry.

The large fraction of carbon monoxide (CO) emissions for this sector are believed to be an NEI reporting error, as 92 percent of all carbon monoxide emissions listed in NEI are from a single facility. This error also contributes to the magnitude of energy-related CAP emissions resulting from internal combustion engines and gasoline consumption shown in Figure 25, as that same facility accounts for 98 percent of all CAP emissions resulting from internal combustion engines. After correcting for this error by eliminating the data from that facility, total energy-related CAP emissions for the motor vehicle parts manufacturing industry are approximately 867 TPY (as reported in Table 13, Section 2.3.3), carbon monoxide emissions comprise around 23 percent of energy-related CAP emissions, and nitrogen oxide emissions comprise around 57 percent.

Figure 25: Motor vehicle parts manufacturing sector: CAP emissions by source category and fuel usage



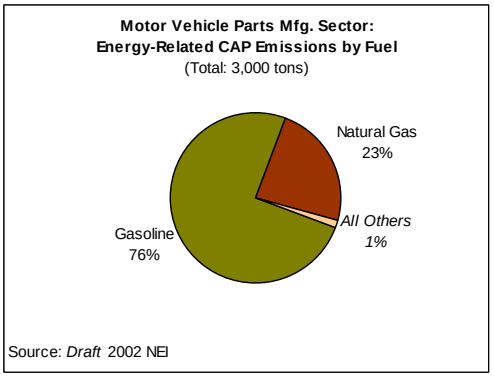


Figure 25 presents NEI data on the sources of energy-related CAP emissions shown in Figure 24, by source category and fuel usage. Though NEI data errors skew the Figures (as previously noted), reductions in onsite energy consumption would have the largest effect on nitrogen oxide emissions resulting from natural gas fuel use.

In terms of CAP emissions, the energy-related environmental footprint for this sector is expected to increase as energy usage increases. Given the sector's dependence on purchased electricity, a fraction of its energy-related environmental footprint is linked to trends in electric generation, with substantial energy-related emissions impacts occurring at the utility level. CAP emissions from natural gas and petroleum fuel use occur at the facility level, and overall increases in energy consumption are likely to increase these energy inputs as well.

As there are no energy consumption projections for the motor vehicle parts manufacturing industry contained in AEO 2006, we do not report carbon dioxide emissions projections for this sector. However, increasing energy consumption would lead to increased carbon dioxide emissions as well.

3.10.2 Best Case Scenario

Opportunities

Table 51 ranks the viability of five primary opportunities for improving environmental performance with respect to energy use (Low, Medium, or High). A brief assessment of the ranking is also provided, including potential barriers.

Table 51: Opportunity assessment for the motor vehicle parts manufacturing industry

Opportunity	Ranking	Assessment (including potential barriers)
Cleaner fuels	Low	Due to the sector's dependence on purchased electricity, the environmental impact of energy inputs will follow national trends for electric generation. There may be some opportunity for clean fuels improvement through increased use of renewable energy in electric power generation.
Increased CHP	Low	Sector shows little CHP potential.

Opportunity	Ranking	Assessment (including potential barriers)
Equipment retrofit/ replacement	Medium	As in other sectors, replacing aging equipment with state-of-the-art equipment offers potential for efficiency improvement in the motor vehicle parts industry. One example cited by APMA includes fuel-fired equipment controlled by oxygen trim controls to improve combustion efficiency. Facility lighting and HVAC improvements offer additional opportunities for energy savings.[274]
Process improvement	High	Process improvements offer less capital-intensive opportunities for energy efficiency improvement and also may improve product quality and reduce operating costs. System optimization for compressed air, exhaust, and make-up air systems was cited as a best practice by APMA.[275] In plastics molding, reducing the time involved in press changeovers decreases idle running time and saves energy.[276] Other process improvement opportunities may be similar to those found in the metal casting industry, and painting process improvements may be similar to those found in motor vehicle manufacturing.
R&D	Low	Our research did not produce any information regarding an R&D pipeline of energy efficiency technologies unique to this sector.

Optimal Future Trends

As no energy use projections are available for the motor vehicle parts manufacturing industry, it is not possible to compare a business-as-usual energy scenario with an optimal energy scenario. However, a preferred energy management strategy for the industry would primarily involve faster replacement rates of existing equipment with energy-efficient equipment and increased adoption of process improvements.

Environmental Implications

Given the motor vehicle parts manufacturing industry's dependence on purchased power, and due to the magnitude of energy losses during electric generation and transmission, efficiency gains at the facility level have a magnified impact on energy-related emissions at the utility level. Due to the magnitude of energy losses during electric generation and transmission (more than twice the amount of delivered energy for fossil fuel-fired power plants), efficiency gains at the site level have a magnified impact on energy-related emissions at the utility level. At the facility level, energy efficiency improvements will primarily affect nitrogen oxide emissions. However, due to the geographic dispersion of the industry, energy trends are unlikely to have a noticeable impact on regional air quality.

3.10.3 Other Reference Materials Consulted

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