



# Industrial Ventilation Market Research

## February 2008



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## Executive Summary

The National Energy Management Institute (NEMI) engaged FMI Corporation (FMI) to conduct a market research study of the industrial ventilation market. The purpose of the study was to estimate the overall market size, capital entry requirements, potential revenue, associated labor hours and wages for the union sheet metal and HVAC industry. This study shows the growth of the industry over a period of three years, as well as market trends and buying behaviors, which directly determine the union sheet metal industry's share of industrial ductwork and sheet metal fabrication in the industrial ventilation market. This document represents the results of these studies.

In addition to a thorough scan of industry/trade publications and government data, surveys were distributed to approximately 1,200 identified industrial ventilation providers and manufacturers. Sixty of these surveys were returned and analyzed, the results of which are included in our report. About 10 industry stakeholders were also interviewed by FMI staff researchers to further determine the current market conditions.

The industrial ventilation market is complex and difficult to quantify. Because of the market complexity, data are harder to capture and results are hard to estimate. FMI's market size and growth represents an accurate "order of magnitude" comparison of market opportunities. As stated above, estimates are based on market surveys and stakeholder perceptions. FMI also used alternative modeling methodology to verify the following reported results.

Adding to the complexity of estimating the industrial ventilation market size, are the diverse building structures that make up the sector. This report identifies 12 building types that are included for analysis, but does not delve deeply into the wide characteristic differences between these building types. Variation between these building types could alter our estimates slightly. Additionally, no current data exists to compare single building types within the defined industrial sector.

Overall, our research indicates opportunities for industrial ventilation related work will continue in the near future. In 2008, we estimate the total market (all providers) to be \$1.5 billion and to grow to \$1.8 billion in 2010. These calculations represent a 17% market growth from 2008 to 2010. Cumulative market growth expectations between 2008 and 2013 reach 56% and the industrial ventilation market has the potential to grow almost 150% over the next ten years, reaching \$3.8 billion. Approximately one-third of the industrial ventilation market is comprised of opportunities located in new construction in 2008. The remaining two-thirds of industrial ventilation opportunities reside in retrofit and existing construction.

Survey participants identified new construction as the faster growth opportunity for industrial ventilation applications for the near future. New construction revenues will grow between 12-15% annually in 2009 and 2010, totaling \$737 million in 2010. Existing construction applications will grow between 3-6% during the same time. FMI modeling estimates there are potentially 3.2 million union labor hours available in the total industrial ventilation market in 2008, of which 1.2 million are in new construction opportunities.

Industrial ventilation growth has been driven primarily by greater market awareness of IAQ, as measured by employee safety standards, the continued success of the LEED certification program and the U.S. Green Building Council push towards sustainable, Green construction and increased energy efficiency.

Currently, existing building retrofits are a lagging indicator of the acceptance of new energy efficient construction standards. New construction projects are able to capitalize on emerging energy efficiency trends more quickly than buildings undergoing renovations or retrofits. However, the ability of new construction projects to embrace Green construction practices and utilize energy savings through design and specification changes will soon be more readily embraced with renovation projects.

Although the new construction market opportunity is growing faster over the next 2-3 years than the existing building market opportunity is, FMI believes long-term growth opportunities for industrial ventilation systems are found in renovation and retrofit applications. Five-year and ten-year growth projections for existing building industrial ventilation revenue reach 51% and 164%, respectively. Comparatively, new construction 5-year and 10-year projections reach 63% and 127%, respectively.

Growth of the total industrial ventilation market is important to sustain market opportunities, but the ability of the union labor force to increase their market share will have a much larger impact on potential union labor opportunities. The ability of the union labor force to grow current market share by 5% over the next three years, could increase potential labor opportunities by 14%.

FMI believes the existing building growth opportunities will begin to outgain new construction opportunities for industrial ventilation sometime between 2010 and 2013. Both building types will continue to grow, but a shift in construction spending from new buildings to renovations, as well as the realization of energy efficiency savings in retrofit applications will drive industrial ventilation opportunities in the existing building stock. A concerted effort to market energy efficiency benefits of industrial ventilation and capitalize on the substantial growth in renovation construction must be undertaken to achieve the potential opportunities for industrial ventilation growth over the next decade.

## Overview

The NEMI leadership has developed a defined process (NEMI Activities Matrix) that involves a research and planning phase prior to committing to any major program development. NEMI's current interest lies in evaluating the market potential for the HVAC-related industrial ventilation market.

Industrial ventilation includes fabrication, erection and/or installation of any item not incorporated into the HVAC system of an industrial facility. It is inclusive of maintenance, service, design or replacement of any fume, particulate, or dust collection system or part of any industrial firm's production process. This definition is inclusive of all ductwork systems (hoods, exhaust stacks, dampers, equipment supports) and sheet metal fabrication (chutes, hoppers, conveyance equipment, structural support frames and platforms, fan and blowers).

This report addresses the industrial ventilation market, as defined by the Department of Commerce and includes both new and existing building markets. To complete the core NEMI Activities Matrix, FMI conducted the following research:

1. Identify Potential Market
2. Determine Capital Entry Requirements
3. Determine Revenue Potential
4. Determine Hours of Work and Wage Potential
5. Market Entry (expansion) Plan
6. Quantifiable Success Determiners

### *Definition*

- According to *Industrial Ventilation, A Manual of Recommended Practice*, the industrial ventilation system includes both the supply and exhaust systems.
  - Supply systems are used to create a comfortable environment in the plant and to replace exhausted air from the plant.
  - Exhaust systems include both general exhaust systems and local exhaust systems.

- An industrial sheet metal contract includes the following as a definition of industrial ventilation:

*“The fabrication, erection and/or installation of any item not intended for incorporation into the heating, ventilating or air conditioning portion of any new existing industrial plant or facility. Industrial work shall include the maintenance, servicing, relocating, adjusting, designing, measuring or replacement of any fume or particulate control system, part of an industrial firm’s production process; and the maintenance, servicing and adjustment necessary on any heating, air conditioning, cooling or refrigeration used in an industrial process or facility appurtenances intended to facilitate and/or expedite the plant’s production and/or maintain the existing physical structure.”*

- Ventilation plays a big role in overall plant Indoor Air Quality (IAQ). IAQ is governed by ASHRAE Standard 62 and is measured by:
  - Concentrations of unwanted gasses or particles that adversely affect building occupants
  - Adequate ventilation
  - Control of airborne contamination
  - Generation of acceptable temperature and relative humidity

### *Industry Drivers*

- Indoor Air Quality (IAQ) and minimizing exposure to contaminate emissions within industrial facilities will continue to be the over-arching driver to the ventilation industry. Reports show that industrial buildings may contain 10-100 times the contaminate levels of non-industrial facilities.
- Industry drivers have changed slightly over the last few decades. During the 1970s, employee protection was a main issue; in the 1980s and early 1990s, air and water emission control came into its prime; and today, energy efficiency has emerged as a leading driver of ventilation services. In FMI's survey of industrial ventilation contractors and mechanical engineers, energy efficiency was cited as the second most important factor (employee safety was first) to the growth of the industrial ventilation market.
- Energy efficiency concerns are only gaining momentum in the industrial ventilation market. According to a recent publication by *Metal Producing & Processing*, 40% of the energy consumed by most manufacturing facilities is related to fans, pumps and ventilators. Other studies have shown the annual operating costs of ventilation systems exceed the equipment's initial capital cost within two years due to inadequate use or monitoring.
  - Increasing natural gas prices and associated operating costs will also highlight the need for efficient energy consumption in the near future.
- Many of today's market drivers still center on the occupant well-being. Occupant request for improved systems has increased as new innovative technologies have allowed industry participants to more closely monitor and effectively change systems as needed.
  - Connected to legislation efforts, a movement towards energy efficiency and sustainability will create great opportunities for retrofit applications in industrial ventilation.
  - Market technologies, including system and product innovation, will be a substantial driver of industrial ventilation in the future.
- The regulatory environment will continue to drive a favorable industrial ventilation outlook. Regulations from the Occupational Safety and Health Administrative Agency (OSHA) and the Environmental Protection Agency (EPA) should increase potential ventilation opportunities.
  - The Clean Air Act of 1970 and the Occupational Safety and Health Act of 1970 are underlying legislation affecting air quality standards.
  - EPA Maximum Achievable Control Technology (MACT) and OSHA Threshold Limit Values (TLV) are among regulations affecting the Industrial Ventilation market.

- OSHA has established standards for contaminant exposure, known as Permissible Exposure Limits (PEL). The listing of PELs for substances regulated by OSHA is found in the Code of Federal Regulations (20CFR), Part 1910.0000.
- Potential new legislation includes the EPA's Clean Air Interstate Rule (CAIR). More legislation has been proposed, recently (after 2002), with potential indirect affects on the industrial ventilation market (Emission trading programs, 2002; Cool and Efficient Buildings Act, 2004; Energy Policy Act, 2005).
- Alternative energy source manufacturing, including wind and solar, are beginning to make an impression on some industrial ventilation professionals. Alternative power sources are potential new opportunities into the industrial ventilation market and could have considerable growth opportunities based on acceptance rates of these new technologies.

Regulatory changes will not impede industrial ventilation growth, but instead create growth opportunities.

- In conversations with industry officials, the lack of routine maintenance is one of the leading factors in the failure of currently installed ventilation systems. The old "after the fact" or "breakdown" maintenance is still practiced more than industry participants would like to believe. A shift to "preventative" maintenance standards is growing, but continues to have some troubles in justifying needed internal resources.

The installation of inadequate ductwork sizes and configurations, as well as improper filtration specifications are leading causes of industrial ventilation system degradation.

- Increased environmental awareness has increased growth in Green building and use of alternative building materials. Environmental consciousness will have a spill over effect into industrial ventilation and Indoor Air Quality (IAQ), as end-users look to better their manufacturing processes and public reputations.
- Continued growth in power generation construction will also provide ample industrial ventilation opportunities. Market literature and industry stakeholders have echoed the same sentiments when talking about the continued growth in power construction and it's potential effects of growing this market.

*Industry Participants*

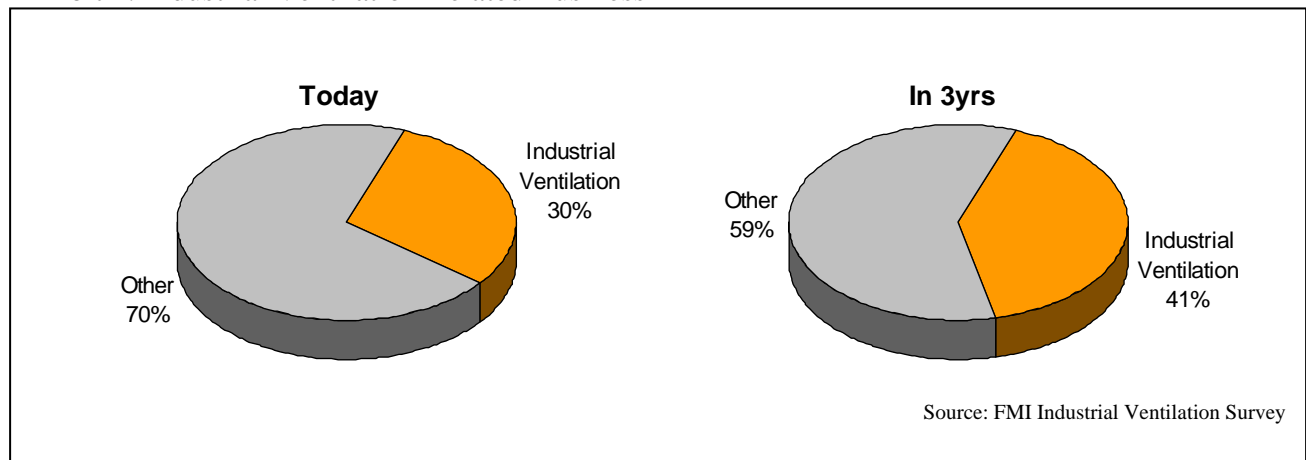
- Exhibit 1 shows the breakdown of building types included in the industrial market, as defined by the Department of Commerce and FMI. Throughout this report, “industrial market” or “market” will refer to the following building types.

**Exhibit 1: Industrial Building Definition**

Sector	Defined Building Types	
Industrial	Chemical manufacturing High Tech Chip Plants Utilities’ Buildings Warehouses, Mines and Mills Food/Beverage/Tobacco plants Computer and Electronic Manufacturing	Automotive Manufacturing Metal and Mineral Fabrication Petroleum and Coal Production Wood Processing Plants Paper and Pulp Facilities Print/Furniture/Textile plants

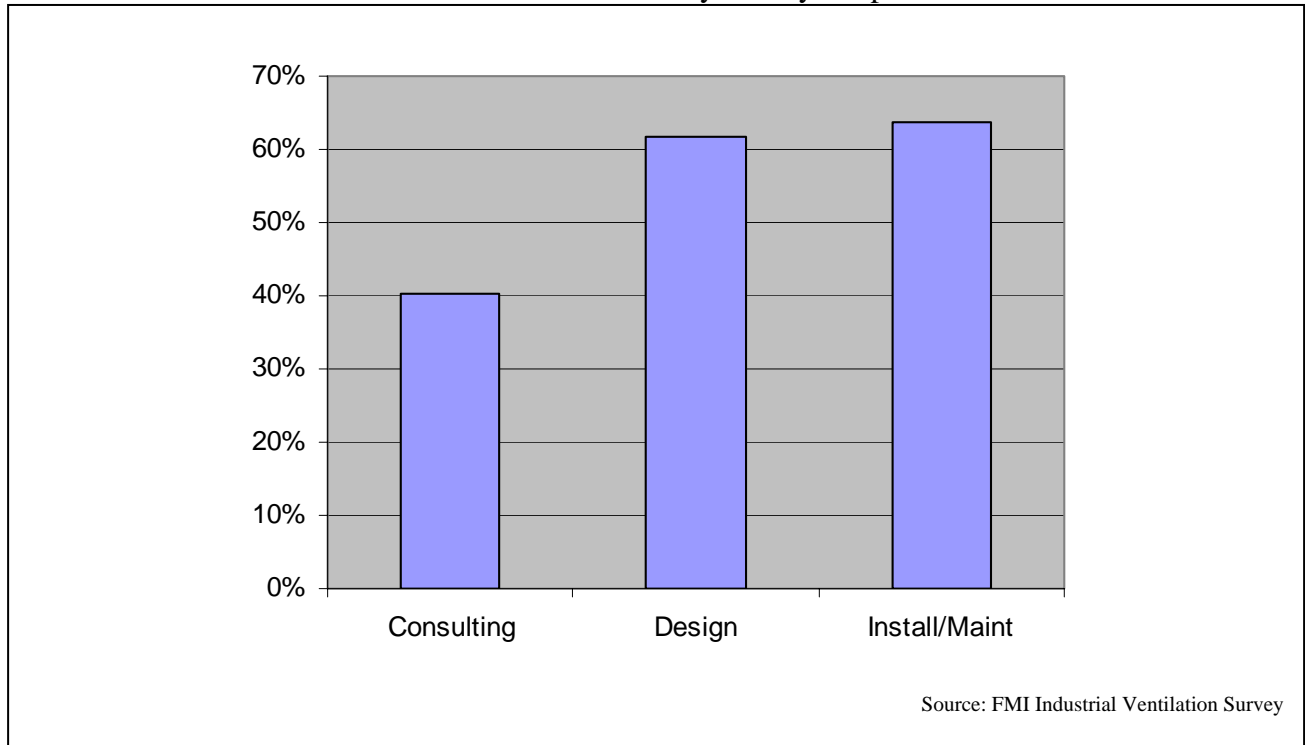
- According to survey respondents, approximately 30% of the responding contractors’ business mix is related to industrial ventilation. Additionally, respondents expect their industrial ventilation related business to grow over the next three years and, by 2010 will account for over 40% of their business.

**Exhibit 2: Industrial Ventilation Related Business Mix**



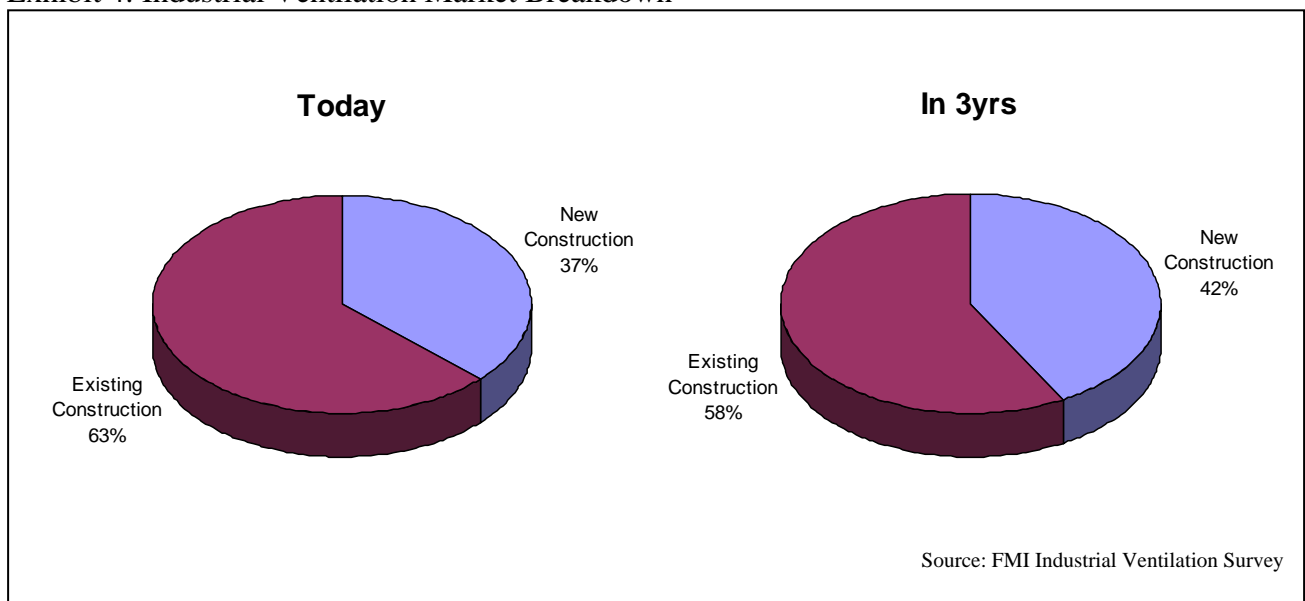
- Four out of ten provider respondents perform consulting services related to industrial ventilation. More than 60% of the survey respondents perform design and installation services.

Exhibit 3: Industrial Ventilation Services Performed by Survey Respondents



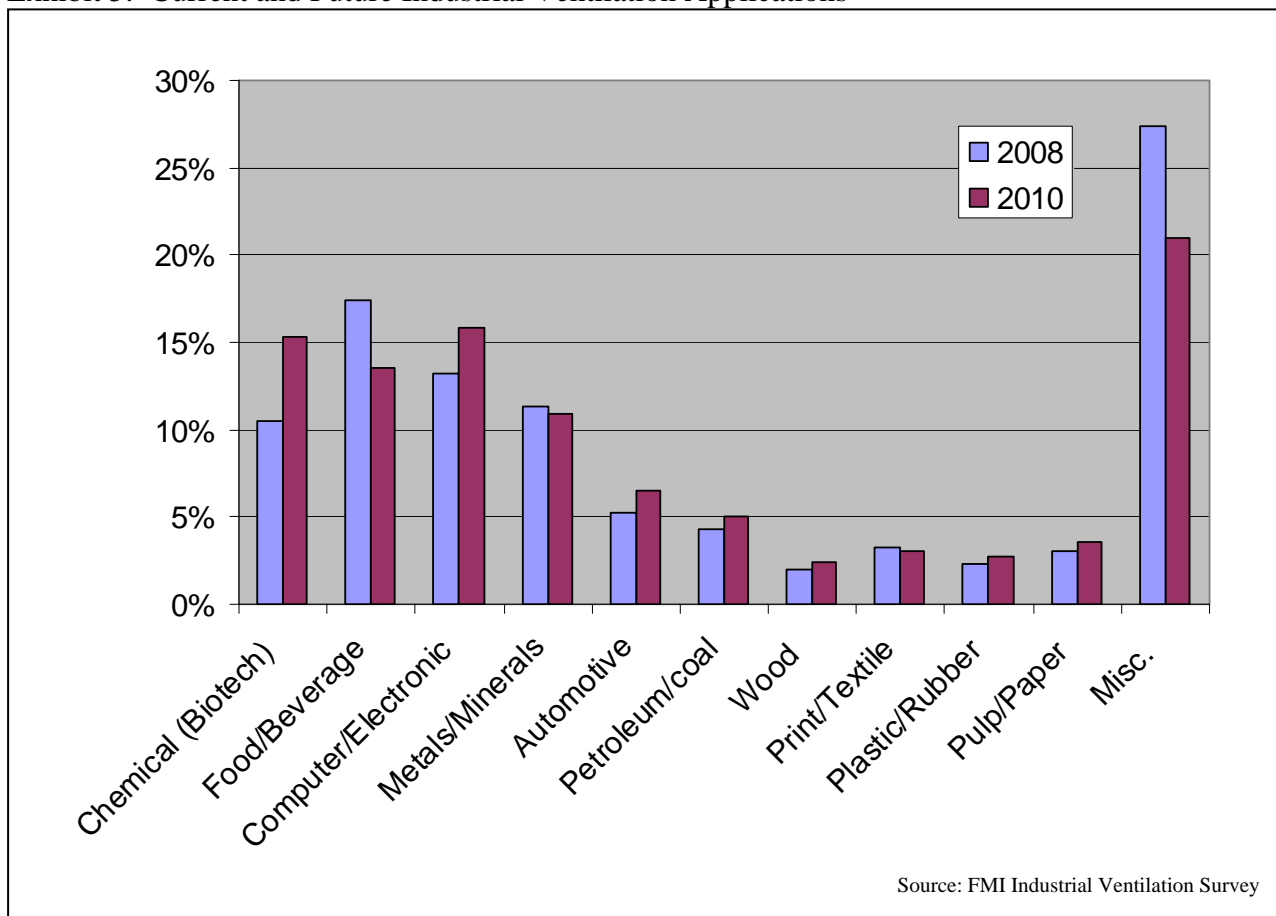
- Industrial ventilation providers also identified a small expected shift from performing work in existing building, to new construction.

Exhibit 4: Industrial Ventilation Market Breakdown



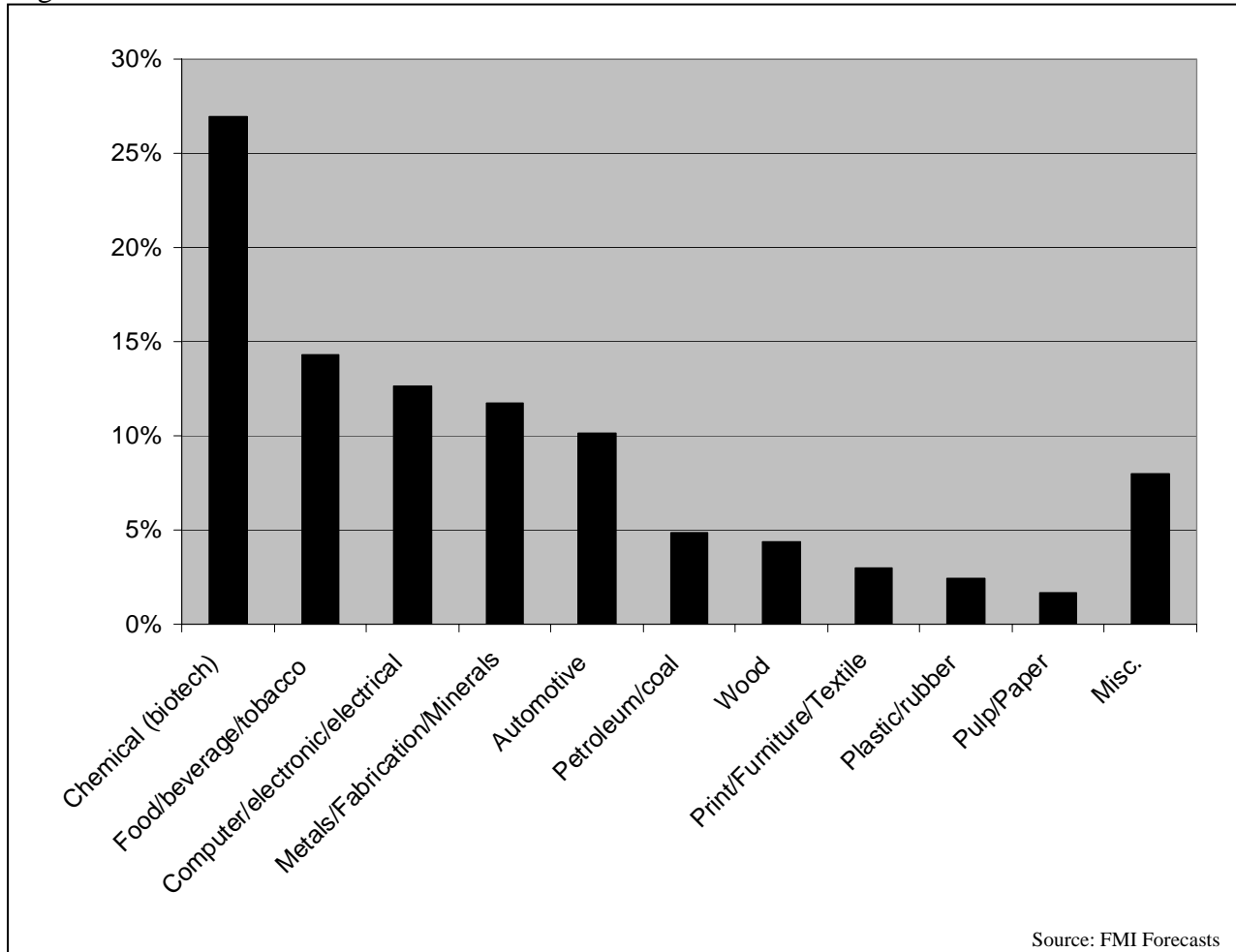
- Within the industrial market, FMI has defined 12 distinct sectors that ventilation is applicable. Miscellaneous, food and beverage, electronic and chemical industries account for the majority of industrial ventilation work, as reported by survey respondents.
  - Miscellaneous industries make a wide range of products that are not produced in the specified manufacturing categories. Examples are medical equipment and supplies, jewelry, sporting goods, toys and office supplies.
- By 2011, respondents expect a decrease in miscellaneous applications, but an increase in chemical and biotech industry and the computer/electronics industry.

Exhibit 5: Current and Future Industrial Ventilation Applications



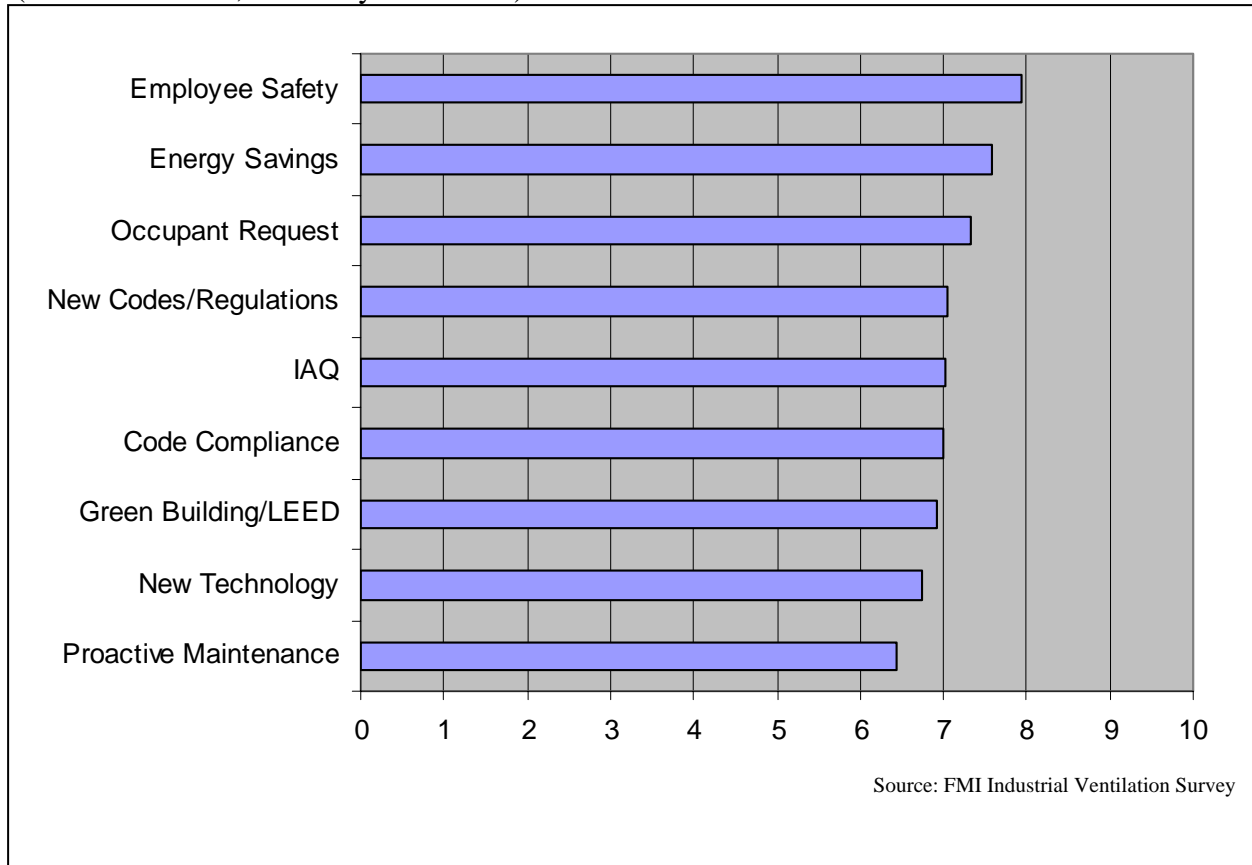
- Exhibit 5 showed the application percentages of industrial ventilation work according to survey respondents. Exhibit 6 shows the market size of each sector, shown as a percentage of total put in place construction spending for the industrial segment.

Exhibit 6: 2008 Put in Place Construction Spending by Sector as a Percent of the Total Industrial Segment



- Exhibits 5 and 6 show that both the current application of industrial ventilation (Exhibit 5) and the strongest construction spending (Exhibit 6) are occurring in the five or six sectors within the industrial segment. Overlap of sector growth and contractor participation bodes well for increased growth in industrial ventilation applications.

Exhibit 7: Factors Influencing the Growth of the Industrial Ventilation Market, Provider Response (1 = no influence; 10 = very influential)



- In Exhibit 7 the average score given by all provider respondents, ranked on a scale of 1 to 10, shows the likely influence of each factor in the growth of the industrial ventilation market.
- Employee safety (7.9/10.0) ranked the highest of nine factors influencing the growth of the industrial ventilation market.
- Energy savings and occupant request were rated second and third, respectively, as factors influencing the growth of the industrial ventilation market. Occupant request is a vague response and is most likely influenced by other factors within Exhibit 7. Energy savings, as mentioned earlier in this report, is the one growth driver that is widespread across all respondents.

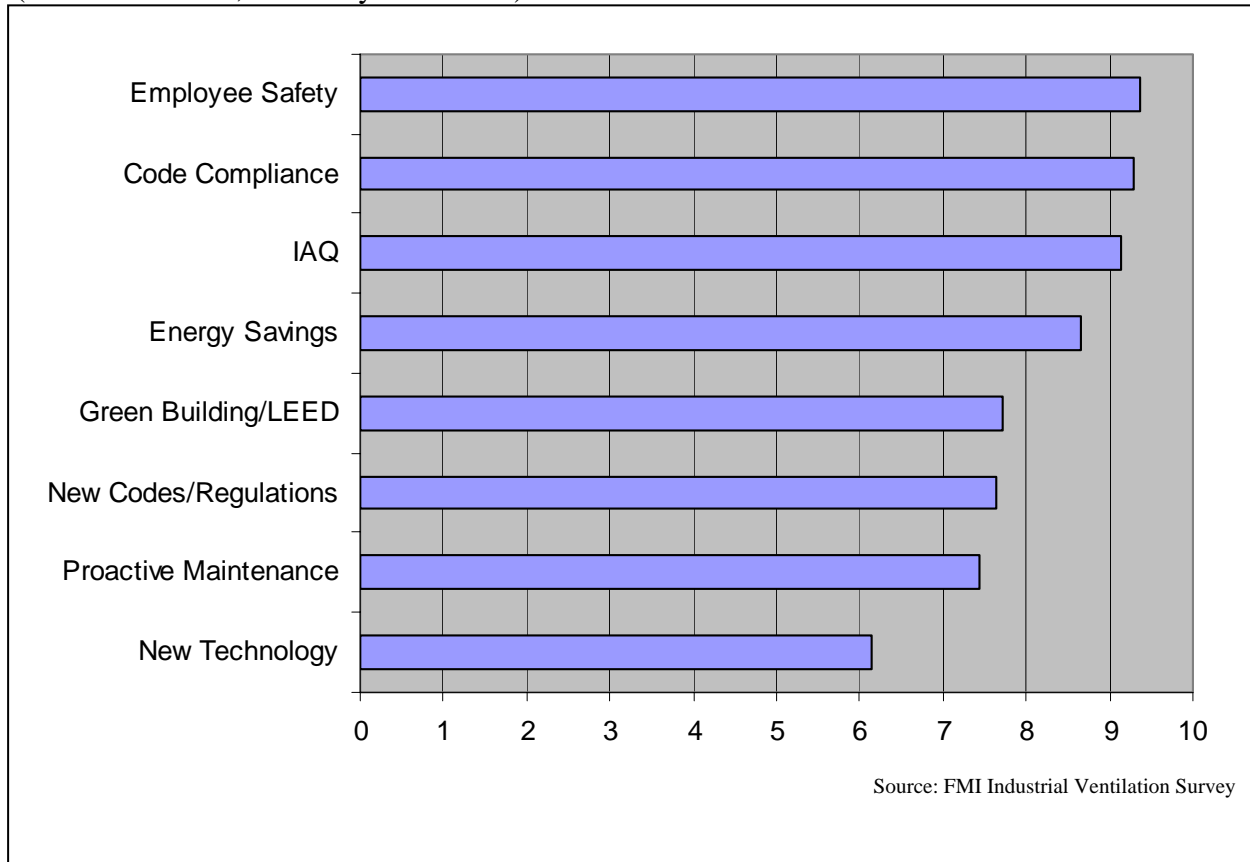
*“EPA requirements are getting more stringent and energy management is going to become a big driver of our industrial business.” – Mechanical Contractor*

- As stated earlier, IAQ will also shape the growth of the market. IAQ ranked fifth among influencing growth factors, but total air quality is directly correlated with a building occupant’s likelihood to complain.

- In Exhibit 8 the average score given by all owner/design representative respondents, ranked on a scale of 1 to 10, shows the likely influence of each factor in the growth of the industrial ventilation market.

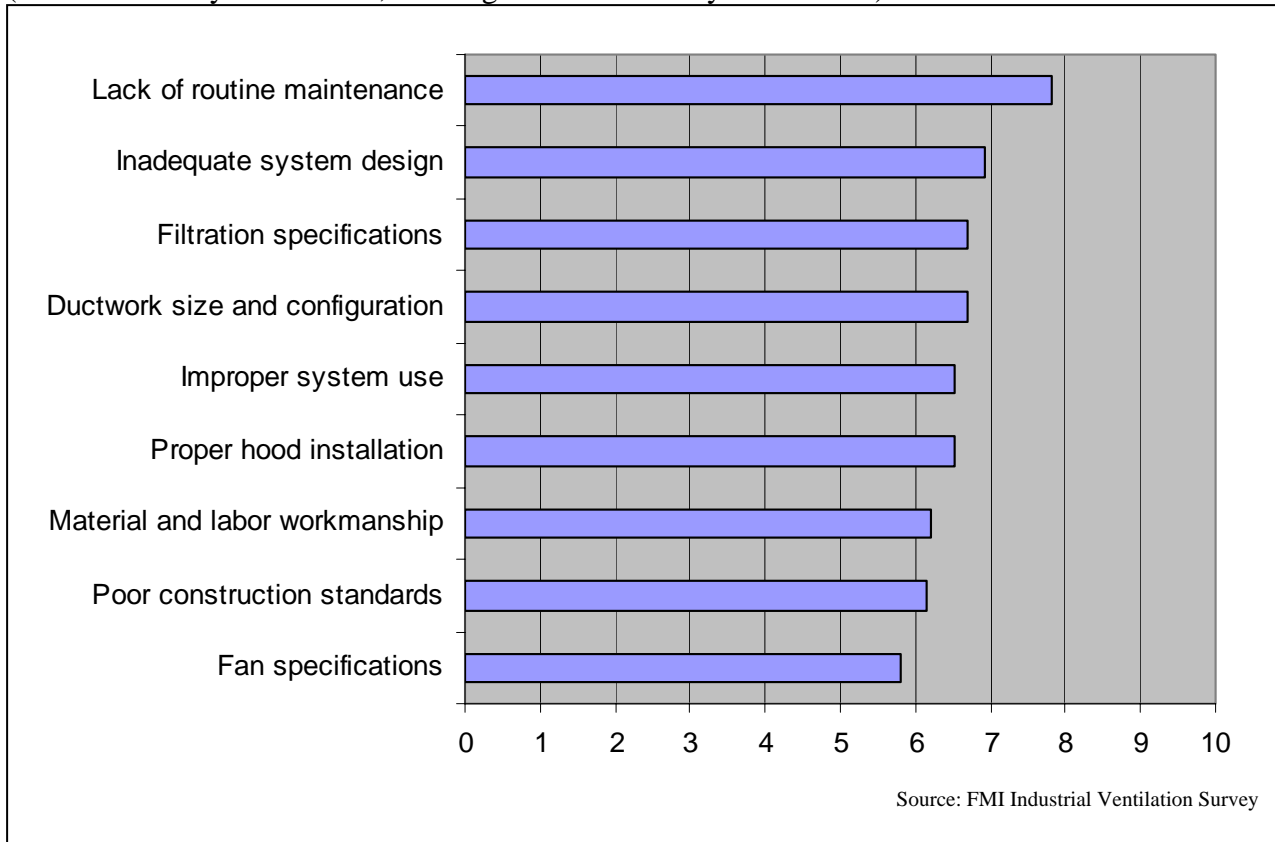
Exhibit 8: Factors Influencing the Growth of the Industrial Ventilation Market, Owner/Design Representative Response

(1 = no influence; 10 = very influential)



- Employee safety is the top priority for both providers and owners of industrial ventilation. Specifiers ranked code compliance (9.3/10) as the second influencing factor to the growth of the industrial ventilation market, while providers believe energy efficiency (7.6/10) will be the second largest driver of market growth.
- Both providers and owners ranked Green Building/LEED in the middle of the nine growth factors. FMI believes this factor to be somewhat understated due to the fact that respondents may not be knowledgeable about specific Green building standards, but have recognized the benefits of Green building through the higher ranking of other influencing factors (IAQ and energy efficiency). Improved IAQ and energy efficiency improvements may be results of Green building.
- Proactive maintenance (6.4/10, provider; 7.4/10, specifier) and emergence of new technologies (6.7/10, provider; 6.1, specifier) ranked at the bottom for all survey respondents.

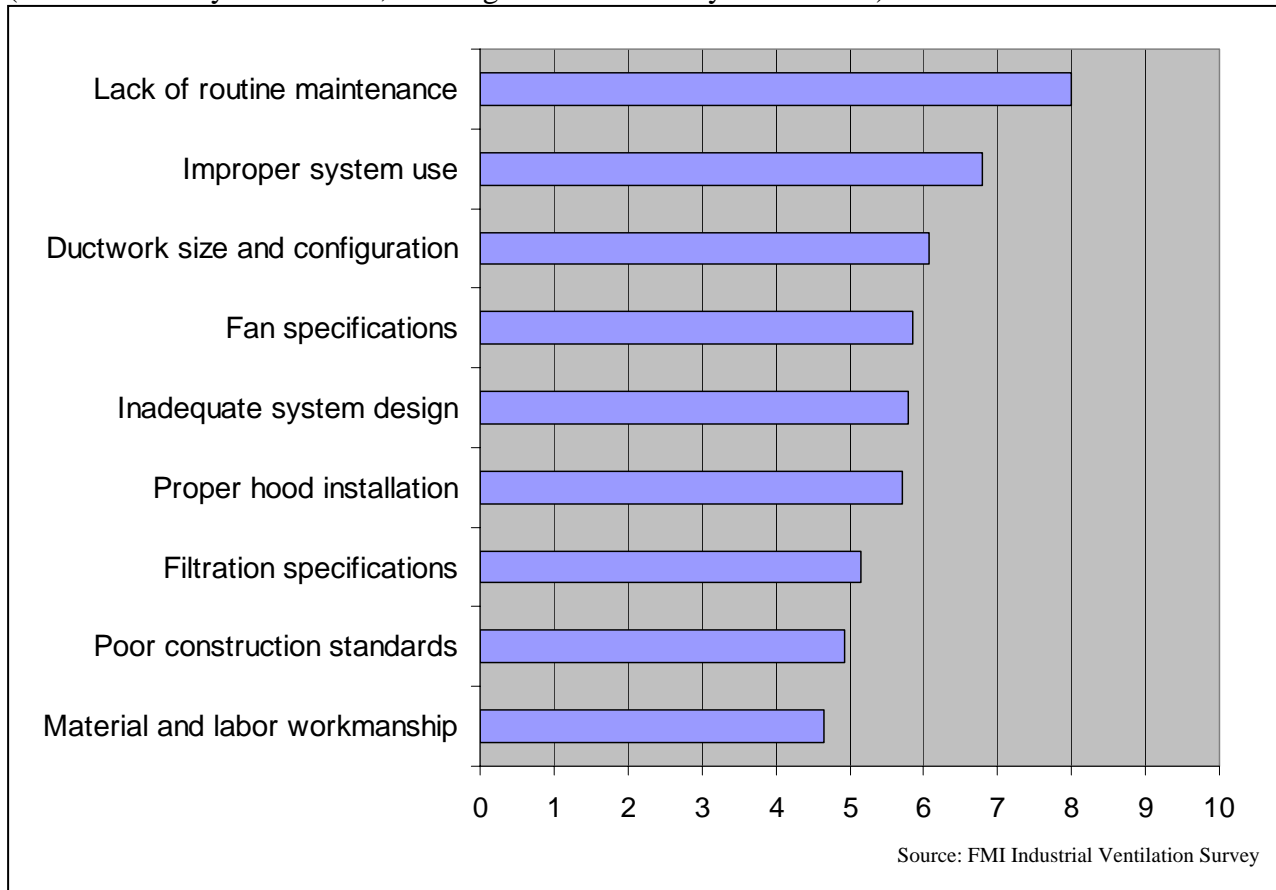
Exhibit 9: Reasons for Industrial Ventilation System Failure, Provider Response  
 (1 = no role in system failure; 10 = significant role in system failure)



- Provider survey respondents perceive lack of routine maintenance (7.8/10.0) and system design (6.9/10.0) as the top reasons for system failure. Material and labor workmanship and poor construction standards were at the bottom of the list for probable system failure causes.

Exhibit 10: Reasons for Industrial Ventilation System Failure, Owner/Design Representative Response

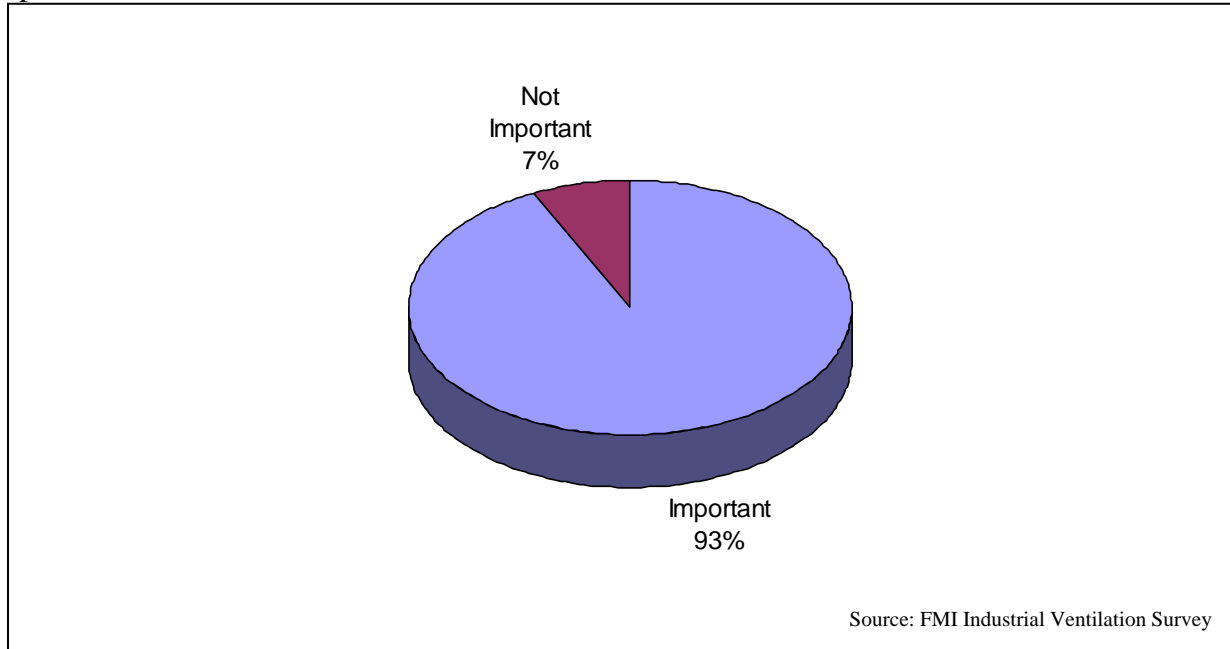
(1 = no role in system failure; 10 = significant role in system failure)



- Both provider and specifier survey respondents identified the lack of routine maintenance as the largest reason for industrial ventilation system failure (7.8/10, provider; 8.0/10, specifier)
- Poor construction standards (4.9/10) and labor workmanship (4.6/10) were identified by specifiers as having the smallest role in system failure. Likewise, providers identified both construction standards (6.1/10) and labor workmanship (6.2/10) as having a minimal effect on system failure.

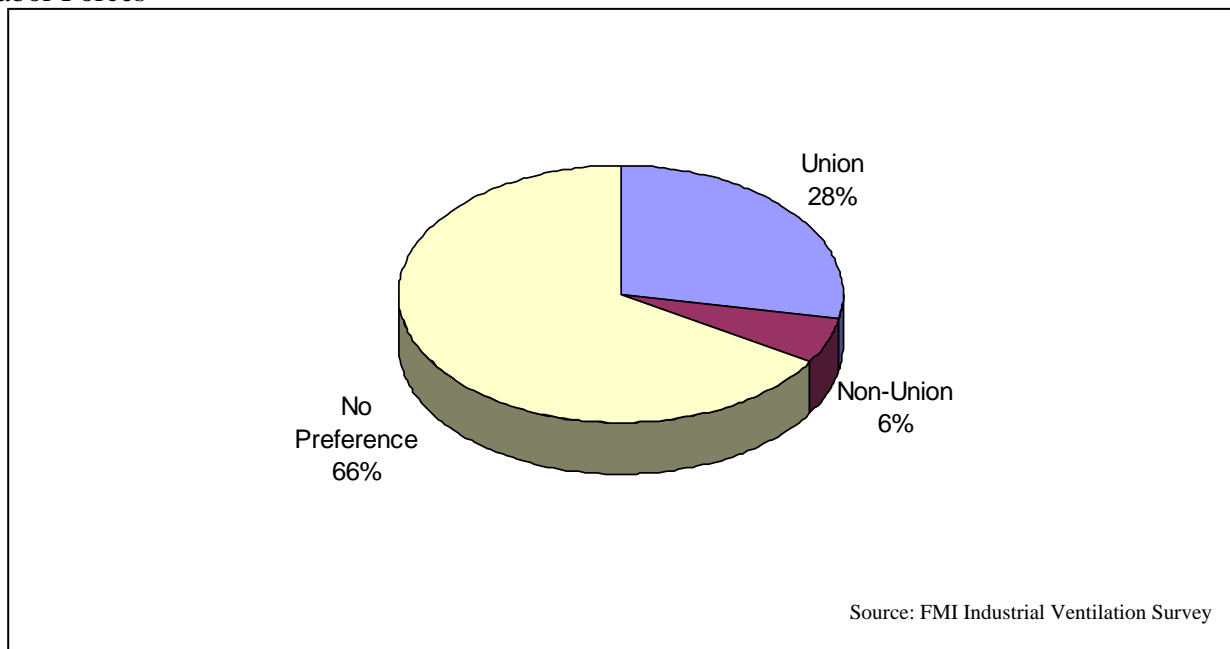
- Owner/Design representative respondents overwhelmingly identified a preference for certified providers of industrial ventilation services.

Exhibit 11: Importance of a Certified Industrial Ventilation Provider to the Owner/Design Representative



- Both providers and owners showed a preference for union labor over non-union labor, while the majority of respondents had no preference to the affiliation of the provider.

Exhibit 12: Total Survey Respondent (provider and owner) Preference for Union or Non-Union Labor Forces



## Capital Entry Requirements

- Providers listed these skill sets as the most necessary when performing industrial ventilation services. Exhibits 13 and 14 are representative lists and do not included all skill sets or capital costs associated with entrance into the industrial ventilation market.

Exhibit 13: Potential Required Skill Sets for Industrial Ventilation Services

Rigging and Hoisting	Two year Technical Degrees
Sheet Metal and Steel Fabrication	TAB Certification
Advanced HVAC Equipment Courses	Mechanical Industry Experience
Welding Training	Airflow Design Application
Certification Training	Mathematical and Mechanical background

- Basic understanding and familiarity of HVAC installation, maintenance and airflow design applications are necessities for industrial ventilation services.
- Additionally, Exhibit 14 shows a brief list of market entry requirements. This items are required to participate in the industrial ventilation business, but do not represent all costs or equipment necessary to sustain an industrial ventilation business.
- One large cost not included in Exhibit 14 is safety costs and qualifications (certification, training, etc). Safety requirements will vary from project to project, but safety specification and mandates are becoming the norm, rather than the exception.
- Basic tools and costs associated with the manufacturing or fabrication components of this business are not included in Exhibit 14. Estimates for shop equipment may exceed costs \$250,000.
- Basic tools needed for traditional or architectural fabrication needs will not suffice for industrial fabrication needs. For example, rolls and shears are larger and capable of higher capacity than those used for architectural fabrication.

**Exhibit 14: Capital Equipment Requirements for Industrial Ventilation Services**

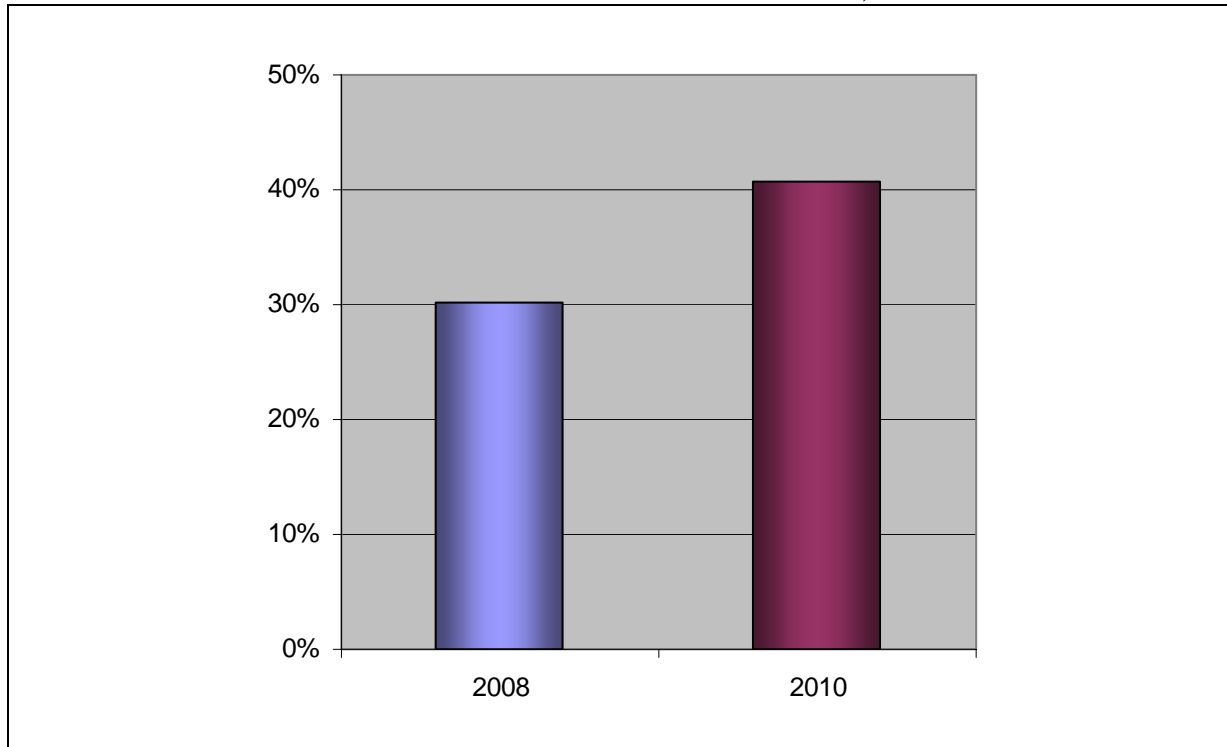
<b>Equipment</b>	<b>Approximate Cost Range</b>
Forklifts	\$600-1200/wk (rental) \$7,000-12,000 (purchase)
Cranes and Man Lifts	\$350-500/wk (rental) \$25,000-\$70,000 (purchase)
Rigging Equipment	\$5,000-7,000
Welding Equipment	\$2,500-4,500/per machine
Plasma Table	\$75,000 - \$100,000
Plasma Table Software	\$8,000-12,000
Flow Hoods	\$400-600
Velometer	\$200-700
Particle Counters	\$1,000-1,200

- The industrial ventilation market is highly fragmented with small, regional contracting firms providing fabrication, testing and engineering services.
- Due to size limitations and weight considerations, manufacturing/fabrication capabilities on a local or regional level will continue to be important to end-users.
- Providers of industrial ventilation must have the ability to adapt to evolving customer demands and market changes.

## Market Size Estimate and Potential

### Current Market Estimate

Exhibit 15: Business Conducted in Relation to Industrial Ventilation; 2008 vs. 2010



- According to survey respondents, almost 30% of their current business is conducted in relation to industrial ventilation and related services. Respondents expect a shift towards their industrial ventilation business by almost 11% between 2008 and 2010. The increase of survey respondents' business mixes suggests current providers of these services expect growth in the marketplace, or are not currently maximizing their market opportunities.
- FMI estimates that the total Put in Place construction spending for the industrial market will increase between 3-5% annually from 2008 through 2010. An increase in total construction spending and an increase in expected work to be completed by contractors would support expectations of modest growth in the industrial ventilation market. Building types included in FMI estimate for the industrial market are presented in Exhibit 16.

Exhibit 16: Estimated Percent of Buildings by Sector Applicable for Ventilation Systems

Sector	Defined Building Types	
Industrial	100%	Chemical Manufacturing High Tech Chip Plants Utilities' Buildings Warehouses, Mines and Mills Food/Beverage/Tobacco Plants Computer and Electronic Manufacturing Automotive Manufacturing Metal and Mineral Fabrication Petroleum and Coal Production Wood Processing Plants Paper and Pulp Facilities Print/Furniture/Textile plants

- The total value of construction applicable for industrial ventilation systems was calculated from FMI construction forecasts of Exhibit 6 building sectors. Using pricing guidelines provided from interviewees and survey respondents, proprietary FMI market data and publicly reported construction pricing statistics, an approximate current market size of \$1.54 billion was established. Further explanation of market sizing modeling is shown in Exhibit 17 – 2008 Estimated Industrial Ventilation Market Size and Methodology, located below.
- The following market methodology was chosen for this report over various alternative methods, including calculations based on CFM estimates. Each alternative method was discarded for numerous reasons and the included methodology was validated through additional modeling calculations. To validate our current methodology, FMI looked at the reported labor hours for the total industry and the percentage that was industrial related (including normal industrial HVAC not calculated here). FMI used these approximations to test responsible estimates for the current industrial ventilation market size and market splits.

Exhibit 17: 2008 Estimated Industrial Ventilation Market Size and Methodology (Millions)

	Industrial Ventilation	
Construction PIP	\$37,979	Millions \$
x % New Construction	48%	%
= New Construction PIP	\$18,230	Millions \$
÷ \$/SF Construction Cost	\$98	Actual \$
= Total SF Construction	186	Million Square Feet
÷ Average SF Per Building	49,540	Square Feet
= Total New Building Inventory	3,755	Buildings
x Median Industrial Ventilation Project	\$152,000	Actual \$
= New Construction Industrial Ventilation Market	\$571	Millions \$
<b>\$571 Million Total New Industrial Ventilation Revenue (37% total market)</b>		
<b>\$972 Million Total Existing Industrial Ventilation Revenue (63% total market)</b>		
<b>\$1.54 Billion Total Industrial Ventilation Revenue</b>		

- FMI's has used building square footage solely to determine an approximate size of the new building inventory (number of new buildings constructed) to use as an approximation of the number of potential industrial ventilation jobs that could be completed in 2008. Square foot data is not used to calculate industrial ventilation market growth for the forecast period through 2018.

- The current market size estimate for industrial ventilation market is approximately \$1.54 billion. This total includes both new construction and existing building opportunities.

Exhibit 18: Estimated Market Size for Industrial Ventilation (Millions of Current \$)

Sector	2008	2009	2010	2013	2018
New Revenue	\$ 571	\$ 656	\$ 737	\$ 929	\$ 1,296
Existing Revenue	\$ 972	\$ 1,033	\$ 1,068	\$ 1,472	\$ 2,562
<b>Total</b>	<b>\$ 1,543</b>	<b>\$ 1,689</b>	<b>\$ 1,805</b>	<b>\$ 2,401</b>	<b>\$ 3,859</b>

- FMI estimates the value of industrial ventilation systems installed and maintained could reach almost \$1.8 billion by 2010. This is a 17% increase in value compared to the \$1.54 billion total market expected in 2008. A primary reason for the increase market gain in estimated industrial ventilation revenue is the continued focus of building occupants on IAQ, energy efficiency and Green building initiatives. Growth of the ventilation market will be effected by the continued need for retrofitting and maintaining the existing industrial building stock.
- Additional model calculations take into account individual market growth, industrial ventilation usage increases and material and labor increases.
- Additional segmentation of market sizing reported in this document includes market estimations for industrial ductwork and other sheet metal fabrication. The following definitions will be used throughout the remainder of this report:
  - *Industrial Ductwork* – Includes all ductwork systems, hoods, exhaust stacks, dampers and equipment supports.
  - *Other Sheet Metal Fabrication* – Includes fabrication of chutes, hoppers, conveyance equipment, structural support frames and platforms.
- Survey respondents acknowledged an average split between industrial ductwork and other sheet metal fabrication for typical completed projects. This project split will be used in calculating appropriate labor market potentials.

Exhibit 19: Current Project Split Between Industrial Ductwork and Other Sheet Metal Fabrication

Total Project Size	Industrial Ductwork	Other Sheet Metal Fabrication
100%	58%	42%

## Revenue Estimate and Potential

- Revenue estimates and potential, similar to total market size are equally hard to capture. The revenue estimate represents the opportunity available to industrial ventilation contractors. Industrial ventilation contractors are defined as mechanical, sheet metal and controls contractors. Industry stakeholders acknowledge there is little-to-no preference between union and non-union labor.
- For this analysis, FMI used an estimate of 35% for the work performed by union contractors. FMI believes the union share of work performed is higher in the industrial sector, and even higher within ventilation applications. Possible determinants for this higher work share could include the need of additional training and skill levels possessed by union laborers, as well as the strong market opportunities available in traditionally union-led geographies.

Exhibit 20: Current Market Split Between Union and Non-Union Labor

Total Market Share	Union Market Share	Non-Union Market Share
100%	35%	65%

- Industrial ventilation contractors perform the majority of all work related to industrial ventilation. Therefore, the total potential revenue estimate of \$1.54 billion is available to industrial ventilation contractors.

Exhibit 21: Potential Industrial Ventilation Contractor Revenue Calculation (Millions)

Total Industrial Ventilation Revenues		Industrial Ventilation Market Share		Industrial Ventilation Contractor Potential Revenues
\$1,543M	×	100%	=	\$1,543

- Based on estimates from survey respondents, Industrial Ductwork and Other Sheet Metal Fabrication, on average, account for 58% and 42% of total projects costs, respectively.

Exhibit 22: Estimated 2008 Industrial Ventilation Contractor Revenue (Millions)

	Total	Industrial Ductwork Potential	Other Sheet Metal Fabrication Potential	Union Potential
New Construction	\$ 571	\$ 331	\$ 240	\$ 200
Existing Buildings	\$ 972	\$ 564	\$ 408	\$ 340
Total	\$ 1,543	\$ 895	\$ 648	\$ 540

## Hours of Work and Wage Estimate and Potential

- The hours of work estimate represents the amount of labor-hours available in the current Industrial Ventilation Market performed by mechanical/sheet metal contractors. This is essentially a study of what percent of the direct costs of industrial ventilation are attributable to these workers.
- The costs of industrial ventilation were separated into direct and indirect costs. Direct costs were further separated into component costs including field labor, engineering, shop labor, equipment, material and other.

Exhibit 23: Survey Results Regarding Industrial Ventilation Industrial Ductwork Direct and Indirect Costs

Cost Component(s)	Average % Direct/Indirect Costs	Average % Direct Costs Components
Direct Costs	80%	
Direct Cost Breakdown		
Field Labor		29%
Engineering		6%
Shop Labor		15%
Equipment		19%
Material		26%
Other		5%
		100%
Indirect Costs, OH, Net Profit	20%	
<b>Total</b>	<b>100%</b>	

Exhibit 24: Survey Results Regarding Industrial Ventilation Sheet Metal Fabrication Direct and Indirect Costs

Cost Component(s)	Average % Direct/Indirect Costs	Average % Direct Costs Components
Direct Costs	20%	
Direct Cost Breakdown		
Field Labor		31%
Engineering		4%
Shop Labor		27%
Equipment		11%
Material		23%
Other		3%
		100%
Indirect Costs, OH, Net Profit	20%	
<b>Total</b>	<b>100%</b>	

- Approximately 23% of the Non-HVAC cost to install an industrial ventilation system is attributable to field labor in the U.S. and 25% of the Other Sheet Metal Fabrication cost is related to field labor costs.

**Exhibit 25: Field Labor Costs as a Percent of Total Industrial Ventilation Costs Calculation**

	Direct Costs as a % of Total Costs	×	Field Labor Costs as a % of Direct Costs	=	Field Labor Costs as a % of Total Costs
Industrial Ductwork	80%	×	29%	=	23%
Other Sheet Metal Fabrication	80%	×	31%	=	25%

- Approximately 12% of the Non-HVAC cost to install an industrial ventilation system is attributable to shop labor in the U.S. and 22% of the Sheet Metal Fabrication cost is related to field labor costs.

**Exhibit 26: Shop Labor Costs as a Percent of Total Industrial Ventilation Costs Calculation**

	Direct Costs as a % of Total Costs	×	Shop Labor Costs as a % of Direct Costs	=	Shop Labor Costs as a % of Total Costs
Industrial Ductwork	80%	×	15%	=	12%
Other Sheet Metal Fabrication	80%	×	27%	=	22%

**Exhibit 27: Industrial Ventilation Labor Wages Calculations (Millions)**

	Industrial Ventilation Revenues	×	% Field Labor % Shop Labor	=	Labor Wages
Industrial Ductwork	\$ 895M	×	23%	=	\$ 206M
Sheet Metal Fabrication	\$ 648M	×	25%	=	\$ 162M
<b>Field Labor Wages</b>					<b>\$ 368M</b>
Industrial Ductwork	\$ 895M	×	12%	=	\$ 107M
Sheet Metal Fabrication	\$ 648M	×	22%	=	\$ 143M
<b>Shop Labor Wages</b>					<b>\$ 250M</b>
<b>Total Labor Wages</b>					<b>\$ 618M</b>

**Exhibit 28: Estimated Industrial Ventilation Labor Wages (Millions)**

	2008	2009	2010	2013
New Construction	\$229	\$262	\$295	\$372
Existing Buildings	\$389	\$414	\$428	\$589
<b>Total</b>	<b>\$618</b>	<b>\$676</b>	<b>\$723</b>	<b>\$961</b>

**Exhibit 29: 2008 Estimated Industrial Ventilation Labor Wages (Millions)**

	Total	Industrial Ductwork Potential	Sheet Metal Fabrication Potential	Union Potential
Field Labor Wages	\$ 368	\$ 206	\$ 162	\$ 129
Shop Labor Wages	\$ 250	\$ 107	\$ 143	\$ 87
<b>Total</b>	<b>\$ 618</b>	<b>\$ 313</b>	<b>\$ 305</b>	<b>\$ 216</b>

- The weighted average fully burdened hourly charge for industrial ventilation services is \$67.54. The fully burdened charge for labor includes overhead and profit. Example burdens reported for contractors include payroll taxes, workers compensation, liability insurance and health insurance.

**Exhibit 30: 2007 Estimated Industrial Ventilation Field Labor Hours Conversion**

Labor Wages		Hourly Rate		Labor Hours (thousands)
\$ 618M	÷	\$ 67.54	=	9,144

**Exhibit 31: Estimated Industrial Ventilation Field Labor Hours (Thousands)**

Sector	2008	2009	2010	2013
New Construction	3,384	3,830	4,241	5,132
Existing Buildings	5,761	6,037	6,151	8,122
<b>Total</b>	<b>9,145</b>	<b>9,867</b>	<b>10,392</b>	<b>13,254</b>

- Using FMI estimates of the share of industrial ventilation by HVAC/sheet metal contractors (including union firms), the total hours available are listed in Exhibit 32.

Exhibit 32: 2008 Estimated Industrial Ventilation Labor Hours (thousands)

	Total	Industrial Ductwork Potential	Sheet Metal Fabrication Potential	Union Potential
Field Labor Hours	5,445	3,047	2,398	1,905
Shop Labor Hours	3,700	1,590	2,110	1,295
<b>Total</b>	<b>9,145</b>	<b>4,636</b>	<b>4,508</b>	<b>3,200</b>

- The current amount of industrial ventilation hours available is estimated to be approximately 3.2 million hours. Based on a 2,000 work-hour-year, about 4,600 workers would be required to perform this work on a full-time basis.
- The union potential equates to approximately 1,600 full time union technicians in 2008 and 2,300 full time positions in 2013, an increase of 44% in five years.

Exhibit 33: Estimated Union Industrial Ventilation Employees

	2008	2009	2010	2013
Field Labor Hours	953	1,028	1,083	1,381
Shop Labor Hours	648	699	736	938
<b>Total</b>	<b>1,600</b>	<b>1,727</b>	<b>1,819</b>	<b>2,320</b>

- FMI must note that the full time union positions calculated here are indicative of the present state of *total* workers already providing these services. New worker opportunity would be defined by comparing 2008 estimates to forecast 2013 or 2018 estimates.
- FMI believes the majority of individuals performing this work is currently employed through other industrial market related functions, and as such, the available *new* union worker potential is dependent upon either growing the market or gaining a higher share of the existing market.
- Exhibit 34 shows a hypothetical change in union market share of  $\pm 5\%$  and  $\pm 10\%$  by 2010, from the current 2008 estimate of 35%. For example, if union market share in 2013 would increase 5%, from 35% to 40%, there would be a need for 2,650 workers in 2013 and almost 4,000 workers in 2018. This exhibit shows that even though growing the total market is important to sustain industrial ventilation opportunities, growth in market share would have a much larger impact on union labor potential.

Exhibit 34. Potential Union Labor Growth Opportunities (Actual employees)



- Although the new construction market opportunity is growing faster over the next 2-3 years than the existing building market opportunity is, FMI believes long-term growth opportunities for industrial ventilation systems are found in renovation and retrofit applications. Five-year and ten-year growth projections for existing building industrial ventilation revenue reach 51% and 164%, respectively. Comparatively, new construction 5-year and 10-year projections reach 63% and 127%, respectively.
- FMI believes the existing building opportunities will begin to outgain new construction opportunities for industrial ventilation sometime between 2010 and 2013. Both applications will continue to grow, but a shift in construction spending from new buildings to renovations, as well as the realization of energy efficiency savings in retrofit applications will drive industrial ventilation opportunities in the existing building stock. A concerted effort to market energy efficiency benefits of industrial ventilation and capitalize on the substantial growth in renovation construction must be undertaken to achieve the potential opportunities for industrial ventilation growth over the next decade.

## Market Entry Plan

### *Position NEMI as Knowledge Source*

The sheet metal contractor's HVAC expertise and system knowledge should be championed by SMACNA/SMWIA and NEMI as a subset of other HVAC and related services. HVAC contractors and mechanical contractors are currently providing the majority of industrial ventilation and sheet metal fabrication services.

### *Service Opportunities and Maintenance Contracts*

Market comprehensive maintenance contracts to building owners to fill an identified need in the market. Both provider and owner stakeholders identified ongoing maintenance as a leading cause of industrial ventilation system failure. Maintenance programs and contracts would build needed exposure for new industrial ventilation work, while satisfying ongoing maintenance needs.

### *Leverage Industrial Ventilation Service Exposure for TAB and Air Filtration Services*

Similar skill sets and knowledge standards are applicable in all of these work types. The ability to leverage market presence of industrial ventilation work could open opportunities for related TAB and filtration services.

### *Industry Certification*

Develop a standardized industrial ventilation certification; this could be part of a broad industry certification. Many owners acknowledge a desire for certified labor; however, whether these individuals would pay a premium for certified service providers has yet to be explored. Potential collaboration or consolidation of industry guidelines provided by NEMI and/or other industry groups could further progress the standardization of industrial ventilation services and realize a premium on certified services.

### *Existing Building Market Expansion*

The pursuit of industrial ventilation opportunities through the existing building renovation and retrofit represents a significant growth opportunity.

Potential development of the industrial ventilation market through retrofit and renovation construction will require educating owners and engineers of the many benefits of effective industrial ventilation. We have noted in this report the importance of general employee safety and energy efficiency. Building on these ideas, a comprehensive educational program or initiative, directed at one or more of the desired stakeholders, would be appropriate.

## Quantifiable Success Determiners

- Specific, measurable, factors must be developed to gauge the success of the strategic market entry plan. These metrics should be straightforward for SMACNA/SMWIA/NEMI to evaluate and calculate on a periodic basis. A preliminary list of suggested metrics is provided below. These success factors can be further refined upon review by the NEMI Task Force.

### *Education*

Establish educational material (guidelines, presentations, etc.) for distribution or presentation to mechanical engineers, building owners or design representatives. Measure and analyze usefulness of educational material and increase/decrease of readership among targeted groups, specifically as topics relate to Green building and ventilation benefits.

### *Certification*

Compare industry guidelines in use now and track similar membership numbers for new certification. As stated in this report, Green building and energy efficiency initiatives are influencing industrial ventilation. Positioning of industrial ventilation certification must align with certification in LEED and Green building arenas and could be considered a potential sub-certification within these services.

### *Revenues/Hours/Wages*

Breakdowns of industrial ventilation services by contractor must be continued to allow a more accurate depiction of available and potential man-hours and wage estimates. Metrics must be captured at a detailed level to set benchmarks and provide continuous tracking of completed jobs/hours on all industrial ventilation work. Future revenue projections will be based off of this data.

### *Market Share*

Market metrics should be tracked continuously to measure market gain/decline. Additionally, tracking of job specificity (new construction vs. existing building) percentages with industrial ventilation systems installed must be captured.

## Appendix

*\*Line items throughout appendix may not sum to totals due to rounding.*

### *Industrial Ventilation Market Estimates and Potential*

Total Market (Millions)

	2008	2009	2010	2013
<b>Total</b>	<b>\$1,543</b>	<b>\$1,689</b>	<b>\$1,804</b>	<b>\$2,402</b>

New Construction Market (Millions)

	2008	2009	2010	2013
<b>Total</b>	<b>\$571</b>	<b>\$656</b>	<b>\$737</b>	<b>\$929</b>

Existing Construction Market (Millions)

	2008	2009	2010	2013
<b>Total</b>	<b>\$972</b>	<b>\$1,033</b>	<b>\$1,068</b>	<b>\$1,472</b>

***Potential Market Estimates***
*Total Market (Millions)*

	2008	2009	2010	2013
Industrial Ductwork	\$ 895	\$ 980	\$ 1,047	\$ 1,393
Sheet Metal Fabrication	\$ 648	\$ 709	\$ 758	\$ 1,009
<b>Total</b>	<b>\$ 1,543</b>	<b>\$ 1,689</b>	<b>\$ 1,805</b>	<b>\$ 2,401</b>

*New Construction (Millions)*

	2008	2009	2010	2013
Industrial Ductwork	\$ 331	\$ 380	\$ 427	\$ 539
Sheet Metal Fabrication	\$ 240	\$ 275	\$ 309	\$ 390
<b>Total</b>	<b>\$ 571</b>	<b>\$ 656</b>	<b>\$ 737</b>	<b>\$ 930</b>

*Existing Buildings (Millions)*

	2008	2009	2010	2013
Industrial Ductwork	\$ 564	\$ 599	\$ 620	\$ 853
Sheet Metal Fabrication	\$ 408	\$ 434	\$ 449	\$ 618
<b>Total</b>	<b>\$ 972</b>	<b>\$ 1,033</b>	<b>\$ 1,068</b>	<b>\$ 1,471</b>

***Revenue Estimates and Potential***
*Total Industrial Ventilation Revenue (Millions)*

	2008	2009	2010	2013
Industrial Ductwork	\$ 895	\$ 980	\$ 1,047	\$ 1,393
Sheet Metal Fabrication	\$ 648	\$ 709	\$ 758	\$ 1,009
<b>Total</b>	<b>\$ 1,543</b>	<b>\$ 1,689</b>	<b>\$ 1,805</b>	<b>\$ 2,401</b>

*Union Share of Industrial Ventilation Revenue (Millions)*

	2008	2009	2010	2013
Industrial Ductwork	\$ 313	\$ 343	\$ 366	\$ 487
Sheet Metal Fabrication	\$ 227	\$ 248	\$ 265	\$ 353
<b>Total</b>	<b>\$ 540</b>	<b>\$ 591</b>	<b>\$ 632</b>	<b>\$ 840</b>

***Wages Estimates and Potential***
*Total Industrial Ventilation Wage Estimates (Millions)*

	2008	2009	2010	2013
Industrial Ductwork	\$ 313	\$ 343	\$ 366	\$ 487
Sheet Metal Fabrication	\$ 305	\$ 333	\$ 356	\$ 474
<b>Total</b>	<b>\$ 618</b>	<b>\$ 676</b>	<b>\$ 723</b>	<b>\$ 961</b>

*Total Industrial Ventilation Field Labor Wage Estimates (Millions)*

	2008	2009	2010	2013
Industrial Ductwork	\$ 206	\$ 225	\$ 241	\$ 320
Sheet Metal Fabrication	\$ 162	\$ 177	\$ 190	\$ 252
<b>Total</b>	<b>\$ 368</b>	<b>\$ 402</b>	<b>\$ 430</b>	<b>\$ 572</b>

*Total Industrial Ventilation Shop Labor Wage Estimates (Millions)*

	2008	2009	2010	2013
Industrial Ductwork	\$ 107	\$ 118	\$ 126	\$ 167
Sheet Metal Fabrication	\$ 143	\$ 156	\$ 167	\$ 222
<b>Total</b>	<b>\$ 250</b>	<b>\$ 274</b>	<b>\$ 292</b>	<b>\$ 389</b>

*Union Share of Industrial Ventilation Wage Estimates (Millions)*

	2008	2009	2010	2013
Industrial Ductwork	\$ 110	\$ 120	\$ 128	\$ 171
Sheet Metal Fabrication	\$ 107	\$ 117	\$ 125	\$ 166
<b>Total</b>	<b>\$ 216</b>	<b>\$ 237</b>	<b>\$ 253</b>	<b>\$ 337</b>

*Union Share of Industrial Ventilation Field Labor Wage Estimates (Millions)*

	2008	2009	2010	2013
Industrial Ductwork	\$ 72	\$ 79	\$ 84	\$ 112
Sheet Metal Fabrication	\$ 56	\$ 62	\$ 66	\$ 88
<b>Total</b>	<b>\$ 129</b>	<b>\$ 141</b>	<b>\$ 151</b>	<b>\$ 200</b>

*Union Share of Industrial Ventilation Shop Labor Wage Estimates (Millions)*

	2008	2009	2010	2013
Industrial Ductwork	\$ 38	\$ 41	\$ 44	\$ 58
Sheet Metal Fabrication	\$ 50	\$ 55	\$ 58	\$ 78
<b>Total</b>	<b>\$ 88</b>	<b>\$ 96</b>	<b>\$ 102</b>	<b>\$ 136</b>

***Hours of Work Estimates and Potential***
*Total Industrial Ventilation Labor Hours (Thousands)*

	2008	2009	2010	2013
Industrial Ductwork	\$ 4,636	\$ 5,002	\$ 5,269	\$ 6,720
Sheet Metal Fabrication	\$ 4,508	\$ 4,864	\$ 5,123	\$ 6,534
<b>Total</b>	<b>\$ 9,144</b>	<b>\$ 9,866</b>	<b>\$ 10,392</b>	<b>\$ 13,254</b>

*Total Industrial Ventilation Field Labor Hours (Thousands)*

	2008	2009	2010	2013
Industrial Ductwork	\$ 3,046	\$ 3,287	\$ 3,462	\$ 4,416
Sheet Metal Fabrication	\$ 2,398	\$ 2,587	\$ 2,725	\$ 3,476
<b>Total</b>	<b>\$ 5,444</b>	<b>\$ 5,874</b>	<b>\$ 6,187</b>	<b>\$ 7,892</b>

*Total Industrial Ventilation Shop Labor Hours (Thousands)*

	2008	2009	2010	2013
Industrial Ductwork	\$ 1,590	\$ 1,715	\$ 1,806	\$ 2,304
Sheet Metal Fabrication	\$ 2,110	\$ 2,277	\$ 2,398	\$ 3,059
<b>Total</b>	<b>\$ 3,700</b>	<b>\$ 3,992</b>	<b>\$ 4,204</b>	<b>\$ 5,363</b>

*Union Share of Industrial Ventilation Labor Hours (Thousands)*

	2008	2009	2010	2013
Industrial Ductwork	\$ 1,622	\$ 1,751	\$ 1,844	\$ 2,352
Sheet Metal Fabrication	\$ 1,578	\$ 1,702	\$ 1,793	\$ 2,287
<b>Total</b>	<b>\$ 3,200</b>	<b>\$ 3,453</b>	<b>\$ 3,637</b>	<b>\$ 4,640</b>

*Union Share of Industrial Ventilation Field Labor Hours (Thousands)*

	2008	2009	2010	2013
Industrial Ductwork	\$ 1,066	\$ 1,151	\$ 1,212	\$ 1,546
Sheet Metal Fabrication	\$ 839	\$ 906	\$ 954	\$ 1,217
<b>Total</b>	<b>\$ 1,905</b>	<b>\$ 2,057</b>	<b>\$ 2,166</b>	<b>\$ 2,762</b>

*Union Share of Industrial Ventilation Shop Labor Hours (Thousands)*

	2008	2009	2010	2013
Industrial Ductwork	\$ 556	\$ 600	\$ 632	\$ 806
Sheet Metal Fabrication	\$ 739	\$ 797	\$ 839	\$ 1,071
<b>Total</b>	<b>\$ 1,295</b>	<b>\$ 1,397</b>	<b>\$ 1,471</b>	<b>\$ 1,877</b>

Provider Survey



Industrial Ventilation Market Survey

Industrial Ventilation includes fabrication, erection and/or installation of any item not incorporated into the HVAC system of an industrial facility. It is inclusive of maintenance, service, design or replacement of any fume, particulate, or dust collection system or part of any industrial firm's production process. This definition is inclusive of all ductwork systems (hoods, exhaust stacks, dampers, equipment supports) and sheet metal fabrication (chutes, hoppers, conveyance equipment, structural support frames and platforms, fan and blowers).

To be included in the drawing, please provide us with your contact information

Name: \_\_\_\_\_ Company: \_\_\_\_\_  
 Address: \_\_\_\_\_  
 City: \_\_\_\_\_ State/Province: \_\_\_\_\_ Zip/Postal Code: \_\_\_\_\_

Market Characteristics

1. What % of your business is/ expected to be conducted in relation to Industrial Ventilation?  
 \_\_\_\_\_ % Today \_\_\_\_\_ % in 3 yrs

2. What % of your Industrial Ventilation work is in each of the following segments?

	% Today	% in 3 yrs
Private Manufacturing	_____	_____
Chemical (biotech)	_____	_____
Food/beverage/tobacco	_____	_____
Computer/electronic/electrical	_____	_____
Metals/Fabrication/Minerals	_____	_____
Automotive/Machinery	_____	_____
Petroleum/coal	_____	_____
Wood	_____	_____
Print/Furniture/Textile	_____	_____
Plastic/rubber	_____	_____
Pulp/Paper	_____	_____
Miscellaneous	_____	_____
Total	100%	100%

3. Which Industrial Ventilation role does your firm perform (check all that apply)?

Consulting     Design     Installation/Maintenance

4. What % of Industrial Ventilation in your market is:

Today: \_\_\_\_\_ % New Construction \_\_\_\_\_ % Retrofit  
 In 3 yrs: \_\_\_\_\_ % New Construction \_\_\_\_\_ % Retrofit

Sources & Methods

5. Please rate the following factors as to their importance in the growth of the Industrial Ventilation market:

	Not Important										Very Important									
	1	2	3	4	5	6	7	8	9	10	1	2	3	4	5	6	7	8	9	10
Occupant request																				
IAQ																				
Code Compliance																				
New Codes/Regulations																				
Green Building/ LEED Certification																				
Employee Safety																				
Proactive Maintenance																				
Energy Savings																				
New Technology																				
Other																				

Please indicate 'Other': \_\_\_\_\_

6. Please rate the following factors as to the role each plays in the failure of an Industrial Ventilation System:

	Infrequent cause					Frequent cause				
Lack of routine maintenance	1	2	3	4	5	6	7	8	9	10
Proper hood installation	1	2	3	4	5	6	7	8	9	10
Ductwork size and configuration	1	2	3	4	5	6	7	8	9	10
Filtration specifications	1	2	3	4	5	6	7	8	9	10
Fan specifications	1	2	3	4	5	6	7	8	9	10
Inadequate system design	1	2	3	4	5	6	7	8	9	10
Improper system use	1	2	3	4	5	6	7	8	9	10
Material & labor workmanship	1	2	3	4	5	6	7	8	9	10
Poor construction standards	1	2	3	4	5	6	7	8	9	10
Other	1	2	3	4	5	6	7	8	9	10

Please indicate 'Other': \_\_\_\_\_

7. What percent of Industrial Ventilation services are repairs or retrofits? \_\_\_\_\_ %

8. Is there a customer preference between union and non-union labor?

Union  Non-union  No Pref.

9. What percent of Industrial Ventilation is performed by union and non-union labor? \_\_\_\_\_ % Union \_\_\_\_\_ % Non-union

### Pricing and Delivery

10. How do you typically price Industrial Ventilation System services? (choose all that apply)

Non-HVAC Ductwork

<input type="checkbox"/>	By the System	_____	Price	_____	\$/total system
<input type="checkbox"/>	CFM	_____		_____	\$/CFM
<input type="checkbox"/>	lbs of Steel	_____		_____	\$/lb
<input type="checkbox"/>	Other:	_____		_____	

Sheet Metal Fabrication

<input type="checkbox"/>	By the System	_____	Price	_____	\$/total system
<input type="checkbox"/>	lbs of Steel	_____		_____	\$/lb
<input type="checkbox"/>	Other:	_____		_____	

11. What is the average cost of an industrial ventilation job? And what percent is related to non-HVAC ductwork vs. sheet metal fabrication?

Average cost \$ \_\_\_\_\_ % Non-HVAC ductwork \_\_\_\_\_ %  
 % Sheet metal fabrication \_\_\_\_\_ %

12. Please indicate the breakdown % of the cost in each:

Non-HVAC Ductwork	Non-HVAC Ductwork Direct Costs						OH & Profit
	Material	Equipment	Engineering	Shop Labor	Field Labor	Other	
	%	%	%	%	%	%	%

Sheet Metal Fabrication	Sheet Metal Fabrication Direct Costs						OH & Profit
	Material	Equipment	Engineering	Shop Labor	Field Labor	Other	
	%	%	%	%	%	%	%

13. How many technicians perform this work? \_\_\_\_\_ Estimated number of total annual man hours? \_\_\_\_\_

14. Please indicate the typical fully burdened hourly field charge (includes benefits, etc.) \$ \_\_\_\_\_ /hour

**Industrial Ventilation Trends**

15. *What trends or market drivers do you see occurring in the Industrial Ventilation market?* \_\_\_\_\_  
\_\_\_\_\_
16. *What regulations/legislation does your market follow for Industrial Ventilation?  
Are these enforced federally or locally?* \_\_\_\_\_  
\_\_\_\_\_
17. *What skill sets or educational requirements are needed to provide this service?* \_\_\_\_\_  
\_\_\_\_\_
18. *What personnel certification or industry guidelines does your firm follow?* \_\_\_\_\_  
\_\_\_\_\_
19. *What types of unique shop or field equipment are typically needed to provide this service?* \_\_\_\_\_  
\_\_\_\_\_

*Survey Results (All Respondents where applicable)*

1. What percentage of your business is/expected to be conducted in relation to industrial ventilation?

Today	In 3 yrs
30%	41%

2. What percent of your Industrial Ventilation work is in each of the following segments?

	Today	In 3yrs		Today	In 3yrs
Chemical (Biotech)	11%	15%	Wood	2%	2%
Food/Beverage	17%	14%	Furniture/Textile	3%	3%
Computer/Electrical	13%	16%	Plastic/Rubber	2%	3%
Metals/Minerals	11%	11%	Pulp/Paper	3%	4%
Automotive	5%	7%	Misc.	27%	21%
Petroleum/Coal	4%	5%			

3. Which industrial ventilation role does your firm perform (check all that apply)?

Air Filtration Role	Percentage Performing
Consulting	36%
Design	55%
Installation/Maintenance	57%

4. What percentage of industrial ventilation in your market is New Construction vs. Existing Buildings

	New Construction	Existing Buildings
Today	37%	63%
In 3 yrs	42%	58%

5. Please rate the following factors as to the importance in the growth of the industrial ventilation market.

	Not Important							Important		
	1	2	3	4	5	6	7	8	9	10
Occupant Request	0%	0%	0%	11%	9%	6%	23%	30%	4%	17%
IAQ	4%	0%	6%	4%	6%	4%	23%	26%	19%	6%
Code Compliance	0%	0%	0%	0%	15%	28%	21%	19%	13%	4%
New Codes/Regulations	0%	0%	0%	0%	28%	17%	9%	21%	21%	4%
Green Building/LEED Certification	4%	2%	0%	11%	13%	17%	4%	17%	11%	21%
Employee Safety	0%	0%	0%	0%	6%	21%	15%	11%	23%	23%
Proactive Maintenance	0%	0%	17%	0%	21%	9%	17%	17%	11%	9%
Energy Savings	0%	0%	0%	0%	17%	9%	23%	17%	19%	15%
New Technology	0%	6%	0%	19%	4%	9%	21%	11%	19%	11%

6. Please rate the following factors as to the role each plays in the failure of an industrial ventilation system.

	Not Important						Important			
	1	2	3	4	5	6	7	8	9	10
Lack of routine maint.	0%	0%	4%	9%	2%	6%	11%	19%	32%	17%
Proper hood installation	0%	9%	9%	9%	2%	9%	30%	11%	15%	9%
Ductwork size & configuration	0%	4%	0%	9%	11%	19%	23%	15%	15%	4%
Filtration specifications	0%	0%	13%	0%	6%	21%	30%	11%	13%	6%
Fan specifications	0%	4%	17%	11%	6%	19%	17%	17%	9%	0%
Inadequate system design	0%	4%	4%	0%	7%	9%	24%	24%	18%	9%
Improper system use	0%	4%	11%	6%	9%	19%	15%	9%	21%	6%
Material & labor workmanship	0%	11%	2%	0%	26%	21%	15%	4%	13%	9%
Poor construction standards	2%	0%	11%	4%	26%	17%	13%	11%	11%	6%

7. What percent of industrial ventilation services are repairs or retrofits?

Repairs or Retrofits	61%
----------------------	-----

8. Is there a customer preference between union and non-union labor?

Union	28%
Non-Union	6%
No Preference	66%

9. What percent of industrial ventilation is performed by union and non-union labor?

	Minimum	Maximum	Average
Union	0%	100%	40%
Non-Union	0%	100%	60%

10. How do you typically price industrial ventilation systems?

	By System	CFM	Lbs. of Steel	Other
Industrial Ductwork	80%	12%	8%	--
Other Sheet Metal Fabrication	74%	--	26%	--

11. What is the average cost of an industrial ventilation project? What percent is Industrial Ductwork vs. Other Sheet Metal Fabrication?

Median Cost	% Ductwork	% Fabrication
\$152,000	58%	42%

12. Please indicate the breakdown percentage of the cost in each.

<b>Industrial Ductwork</b>			
Cost Component	Minimum	Maximum	Average
Material	5%	50%	22%
Equipment	0%	55%	16%
Engineering	0%	20%	5%
Shop labor	0%	39%	13%
Field labor	15%	45%	25%
Other	0%	15%	4%
OH & Profit	5%	35%	16%

<b>Sheet Metal Fabrication</b>			
Cost Component	Minimum	Maximum	Average
Material	10%	30%	21%
Equipment	0%	35%	10%
Engineering	0%	10%	3%
Shop labor	5%	80%	24%
Field labor	0%	65%	28%
Other	0%	30%	3%
OH & Profit	6%	37%	12%

13. How many technicians perform this work? Estimated number of total annual man-hours?

	Minimum	Maximum	Average
Number of technicians	2	45	14
Total annual man-hours	560	80,000	27,457

14. Please indicated the typical fully burdened hourly field charge (includes benefits, etc.).

	Minimum	Maximum	Average
Hourly Field Charge	\$46.00	\$115.00	\$67.54

15. What trends or market drivers to you see occurring in the industrial ventilation market?

Tighter emissions standards	Increased demand; decreased workforce supply
Energy conservation	Green building
Growth in alternative energy manufacturing (solar, ethanol)	Concentration on IAQ
Growth in biotech and pharma	

16. What regulations/legislation does your market follow for industrial ventilation?

OSHA	Uniform Building Code
Bay Area Air Quality Management	NSF
SMACNA	IEST
ASHRAE	IBC
EPA	MACT
IRC	MSHA
Local Codes	Project Specific Guidelines

17. What skill sets or educational requirements are needed to provide this service?

Rigging and Hoisting	Two year Technical Degrees
Sheet Metal and Steel Fabrication	TAB Certification
Advanced HVAC Equipment Courses	Mechanical Industry Experience
Welding Training	Airflow Design Application
Certification Training	Mathematical and Mechanical Background

18. What personnel certification or industry guidelines does your firm follow?

OSHA	AWS D1.1 & D9.1 Welding
In-house Safety Program	Site specific Safety Policies
CPR	Lift Equipment
TAB	NEBB
NSF	ISO
ASHRAE	MICCS
Welding Certification	EMR Safety Ratings
NADCA	IAQA

19. What types of services or testing equipment are typically needed to provide this service?

Equipment	Approximate Cost Range
Forklifts	\$600-1200/wk (rental) \$7,000-12,000 (purchase)
Cranes and Man Lifts	\$350-500/wk (rental) \$25,000-\$70,000 (purchase)
Rigging Equipment	\$5,000-7,000
Welding Equipment	\$2,500-4,500/per machine
Plasma Table	\$75,000 - \$100,000
Plasma Table Software	\$8,000-12,000
Flow Hoods	\$400-600
Clean Room Certification	\$-
Velometer	\$200-700
Particle Counters	\$1,000-1,200

*Resources*

\*This is a representative resource list and may not include all resources utilized in the making of this report.

AEI-Brookings Joint Center: New Clean Air Legislation  
American Council for an Energy-Efficient Economy  
ASHRAE Handbook – Heating, Ventilating, and Air-Conditioning Applications  
American Conference of Governmental Industrial Hygienists (ACGIH)  
Building Services and Environmental Engineer Publication  
Chemical Manufacturers’ Association  
Council on Foreign Relations: The United States and Clean Air Legislation  
Energy and Power Management Magazine  
Energy Information Administration (EIA)  
Guiding Principles for Clean-air Legislation  
Health and Environmental Safety Alliance  
Industrial Ventilation – A manual of recommended Practice, 24<sup>th</sup> Edition  
Iowa State University, Industrial Ventilation Fundamentals  
Metal Producing & Processing Magazine  
National Electrical Manufacturers Association  
National Institute of Occupational Safety and Health (NIOSH)  
RS Means Cost Data  
Safety and Health Department, Washington D.C.  
United States Census Bureau  
United States Department of Commerce, Economics and Statistics Administration  
United States Department of Defense, Unified Facilities Criteria (UFC)  
United States Department of Labor, Occupational Safety and Health Administration  
United States Environmental Protection Agency (EPA)  
University of North Alabama  
University of North Carolina, Occupational Safety and Health Research Center  
University of Washington, Field Research and Consultation Group  
Washington State Department of Labor and Industries