

# Northeast Ohio Workforce Assessment

## A Survey of Instruments, Controls and Electronics Companies

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Completed by Kleinhenz & Associates and Cypress Research Group for the Greater Cleveland Partnership

December 2003

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**Greater Cleveland Partnership**

Business United for Progress



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**2003 NORTHEAST OHIO INSTRUMENTS, CONTROLS, & ELECTRONICS INDUSTRY  
WORKFORCE ASSESSMENT**  
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## Executive Summary

The Greater Cleveland Partnership, as part of its Workforce Initiative and its Industry Cluster Project, prepared this report in partnership with Kleinhenz & Associates, Inc. and Cypress Research Group. The report provides a detailed examination of the factors relating to the size and types of individuals employed by Northeast Ohio regional Instruments Controls and Electronics (ICE) companies with special emphasis on the educational, training, and recruiting requirements of these firms. A total of 504 ICE firms classified as either operating as primary or secondary producers of ICE products or services within Northeast Ohio were sent a questionnaire in the summer of 2003. A total of 34 completed questionnaires were returned.

### *The Northeast Ohio Instruments, Controls and Electronics Industry*

- The ICE industry cluster in the Greater Cleveland area is diverse, and includes numerous industry sectors. The most common industry sectors of responding firms were both manufacturers: *Electronic Instrumentation Manufacturing* (38% of responding firms) and *Controls Manufacturing* (29%). Firms also included those in *Distribution* (21%), *Assembly* (18%), *Analytic Instrumentation Manufacturing* (18%), and *Communications Equipment Electronics Manufacturing* (18%).
- On average (median), these firms employed 29 Greater Clevelanders. About one-third of the firms were very small (6-10 local employees), and another third (24%) had between 11 and 99 local employees. The remaining third of the sample base had one hundred or more employees.
- The regional ICE industry also employs a diverse number of professionals, of which 31% can be categorized as ‘support’ professionals within the companies (Human Resources, Finance, etc.). About one-in-six (18%) of ICE cluster employees are specialists within *Assembly*. While engineers are approximately 16% of the regional ICE workforce, there are a large variety of engineers: mechanical design engineers, electrical design engineers, field service engineers, manufacturing engineers, test engineers, printed circuit engineers and technical sales engineers. IT professionals also play a large role in the local ICE professional ranks, making up 8% of this workforce.

### *Current and Anticipated Employment*

- The ICE industry cluster during 2002 registered a modest amount of employment hiring of new employees. Our sample data showed a 4 percent growth of new hires (expressed as a percentage of all current employees) in 2002. Most of those employees (2% of the 4%) were ‘replacement’ employees for existing positions, and the remainder was employees for ‘newly created’ positions.
- Likewise, 8% of the ICE workforce in NE Ohio ‘turned over’ in 2002. A majority of that turnover (75%) was attributed to lay-offs.

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- At the time of our survey (Summer, 2003), 47 percent of responding firms were actively looking to hire at least one full-time position. This represents 1.5 percent of the current workforce in 2003.
  - Most of the current openings were for *Assemblers, Field Service Engineers, Technical Sales Engineers, Product Line Marketer/Manager, Meteorologists, Manufacturing Engineers and Mechanical Design Engineers*.
  - Half of those openings were for those with a minimum of a high-school education. Only 16 percent of the openings required a two-year college degree, and the remaining 36% required a four-year college degree.
- Sixty-two percent of responding firms expected to hire at least one full-time employee in the following year. This represented 3% of the total ICE workforce in NE Ohio.
  - Most of the anticipated openings were for: *Assemblers, Field Service Engineers, Support Professionals, Manufacturing Engineers, and Technical Sales Engineers*.
- Five industry-specific occupations were noted as being both difficult to recruit and key to ICE company's success in the marketplace: *Technical Sales Engineers, Electrical Design Engineers, Purchasing Professionals, Manufacturing Engineers and Meteorologists*. These occupations are deserving of attention by workforce development initiatives designed to bolster the local ICE industry cluster.

### ***Internships and Training***

- Fifty-four percent of responding ICE firms offered at least an internship, summer job, or apprenticeship for students. Most internships (83%) were paid positions requiring college-level students. We estimated that there are about 200 such school-to-work training opportunities within local ICE firms in total.
- One-in-four of responding firms reported having at least one full- or part-time staff member dedicated to the skills training incumbent workers. Most resources dedicated to the training of incumbent workers were described as 'informal and on-the-job' (70% of resources).
- Nearly all firms (94%) reported having no difficulty finding local skills training classes appropriate for their needs (the training noted as being difficult-to-find locally was 'metrology.')
- Almost half (47%) of the firms reported dissatisfaction with the computer science skills of entry-level engineers, signaling a call-to-action for local colleges and universities who are educating engineers.

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## Introduction

This study satisfies the workforce assessment needs of local industry leaders, educational institutions and economic development professionals, and is intended to provide a level of detail necessary to encourage and maintain proactive communication among all of these parties. There are many governmental and academic sources of workforce assessments. Many of these investigations examine workforce trends at either over a broad geography or by occupations. This study however, is customized to satisfy needs often unmet by larger studies: 1) it provides regional data for Northeast Ohio, and 2) it profiles specific information at the occupational level (i.e., specific occupations within Bioscience, not just general disciplines):

1) Regional workforce assessment have proven to be extremely beneficial:

- **Economic development efforts** - The availability of a trained workforce is one of the key decision points for industry relocation. Regions that demonstrate both a depth and breadth of trained workers within a targeted industry have a huge competitive advantage over other regions.
  - **Alignment of area education and training efforts with employers' needs** - When a region's industry and educational systems are working in close partnership, a number of on-going benefits are obtained. Students receive the best guidance possible when potential employers are engaged and communicating with colleges and universities; colleges and universities receive a more steady stream of financial support from local industry, as employers gain assurances that their current workforce needs are being met; and a more predictable supply of well-trained workers becomes available as employers are involved in those workers' education and training. Data as analyzed in this report provide a first step in promoting an on-going dialogue and synergistic relationship between area educators and employers. A region that does not develop and maintain such a relationship could suffer from frustrated employers (who can't find the workers they need) and frustrated educators (who face competition for the best students and ready financial support).
  - **Workforce concentrations recognizing themselves as a 'force' within the region** - Ultimately, workforce development responsibilities are each individual's responsibility. Professionals within any discipline or industry need to take it upon themselves to obtain training, to seek and accept advancement, to instigate or support innovations, to develop professional standards, and to bring along the next generation of professionals. Educational systems and the industry itself can only have a small influence on these activities - most of the impetus needs to come from individuals. Knowledge about the size and scope of one's own profession not only helps individuals understand the professional community in which they live, but it also defines them within the context of all like professionals and empowers them to be more readily open development opportunities.
- 2) This study is purposefully "occupation-based." Economic development initiatives, educational institutions, and industry clusters' leaders require *detailed* information on professionals working within a specific industry cluster. Decision makers often need to know how many, e.g., ICE professionals are in a given geographic area and the *types* of ICE professionals residing in an area (and therefore which types *are not* in a given area). Consequently, educational requirements

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for Northeast Ohio ICE professionals need to be understood. Moreover, skill sets as identified in this report should be catalogued and tracked by colleges and universities for improvement initiatives to be energized and properly direct specific skills needed to benefit this industry in this region.

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## ***Profile of the Cluster***

*The Northeast Ohio instruments, controls and electronics industry provides a wide range of products including industrial control computers, programmable logic controllers, microprocessor based distributed control systems, sensors, motion control systems, energy control systems, flow meters, level indicators and pressure gauges. Many of these devices integrate microprocessors that improve speed, measurement and process control of instruments and systems. Computer software and semiconductor advances are revolutionizing this industry and the manufacturing systems that use these products and devices.*

## ***Industry Trends:***

The ICE industry is responding to an unprecedented industry downturn associated with the recent recession. Companies have also been subject to intense global competition while facing significant slowdown in orders for their high technology products and services.

The semiconductor, wireless communications, optoelectronics industries and producers in the electronics industry, along with the control and information architecture companies, are on the forefront of transforming its industry and manufacturing in general.

Conversion from mechanical to electro-servo control systems enables higher capability product performance with reduced complexity. These advances encompass the production of basic materials such as steel and chemical processes, the development of high tech products and entire integrated systems of computing, communication, measurement and control that will change manufacturing, as we know it today.

The initial 1997 cluster study identified the ICE industry using the Standard Industrial Classification system. The table has been updated using the newly adopted North American Industry Classification System (NAICS). It includes several industry sectors not previously detailed in the previous study since there is not a one to one mapping between the SIC and NAICS systems. The NAICS structure represents a fundamental shift in the ways industries are reported. The former system, the SIC system, focused on what was produced while the NAICS focuses on how products and services are created. This new approach was needed because economies change as new technologies are created and introduced. As such, NAICS was developed to allow users the ability to better track these new and expanding industries. Several of the NAICS changes to industry definitions are notably relevant and are of critical importance in the ICE industry.

As shown in Table 1.0 on the following page, the ICE Cluster, comprised of a variety of high-tech electronic firms, maintained its industry employment of approximately 20,000 between 1995 and 2000. The cluster is moderately gaining scale due to growth in navigational, measuring electro medical and control instruments manufacturing. While the region's overall Location Quotient (LQ)<sup>1</sup> of 1.1 does not indicate that Northeast Ohio has a significant specialization or concentration of

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<sup>1</sup> Location Quotient measures the degree to which an industry is concentrated or specialized in a region relative to the nation using employment shares (jobs) as the input. An LQ less than 1.00 indicates the industry is less concentrated in the region than in the nation, while a value greater than 1.00 indicates the industry is more concentrated in the region than in the nation.

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employment relative to the Nation, the LQ of 1.9 for the core industry sector driving this cluster, Navigational, Measuring, Electro medical and Control Instruments Manufacturing does indicate the region's notable competitive advantage. While significant research and development labs are resident at several large international firms operating in Northeast Ohio these firms do not necessarily have large manufacturing operations located here. Although not shown here, the region possesses several sectors in the cluster having strong productivity as measured by output per employee. In addition, several other sectors are providing a substantive contribution to the cluster. These include commercial and service industry machinery manufacturing and other electrical equipment and component manufacturing.

<b>Industry Description</b>	<b>2000 Employment</b>	<b>Ann % Change 1995-2000</b>	<b>2002 LQ</b>	<b>Wages Per Employee</b>	<b>US Wages Per Employee</b>
Other Chemical Product and Preparation Manufacturing	798	-3.2%	1.6	58.5	52.8
Commercial and Service Industry Machinery Manufacturing	684	3.2%	1.8	30.9	51.1
Communications Equipment Manufacturing	2,781	-0.6%	1.0	53.3	57.9
Semiconductor and Other Electronic Component Manufacturing	3,943	-1.3%	0.5	53.7	48.8
Navigational, Measuring, Electromedical, and Control Instruments	9,558	2.0%	1.9	40.2	57.2
Manufacturing and Reproducing Magnetic and Optical Media	151	0.2%	0.8	81.7	49.0
Electrical Equipment Manufacturing	1,645	-4.6%	1.1	49.4	50.8
Other Electrical Equipment and Component Manufacturing	439	-0.7%	1.8	44.2	50.9
Medical Equipment and Supplies Manufacturing	176	3.3%	1.3	34.9	52.3
Sound Recording Industries	27	1.0%	0.7	38.1	43.7
Scientific Research and Development Services	105	-3.5%	0.5	52.3	52.3
Management of Companies and Enterprises	226	3.2%	1.3	16.3	47.3
	<b>20,550</b>	<b>-0.1%</b>	<b>1.1</b>	<b>45.3</b>	<b>52.2</b>

Source: Economy.Com and Kleinhenz & Associates

Investment during the 3<sup>rd</sup> quarter of 2003 led by consumers, and now joined by business, has returned to pre-recession levels. Investment in communications equipment, and industrial machinery are showing positive growth. Continued business investment and consumer spending will lay the groundwork for recovery in the ICE durable goods sectors. As a whole, the ICE industry provides on average high wages to its workers. The payroll per employee of \$45,300, however, is 13 percent less than the nation's average.

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**Background & Methodology**

- The survey instrument was designed in conjunction with the Instrument, Controls & Electronics (ICE) Industry Cluster initiative, the Greater Cleveland Partnership, and representatives from several Greater Cleveland ICE companies. Special thanks to Michael Sparger of Rockwell Automation Control Systems, Lawrence Meredith of ABB Automation, Inc., Dave Patricy of Keithley Instruments, Dr. Patricia Mintz and Jim Heidenreich of Cuyahoga Community College, Scott Darpel of Cleveland State University, Dr. Michael Branicky of Case Western Reserve University, Jim Robey of Team NEO, and Jeff Thornberry of JR Thornberry, Inc.
- The survey instrument was very similar to survey instruments used in studies conducted from 2000-2003 in the Greater Cleveland area and other Ohio economic regions within various industry clusters: Information Technology, Biosciences/Biotechnology and Advanced Manufacturing.
- The survey instrument was a complex survey, and in part particularly burdensome for companies that employ a wide variety of occupations. It was not doable on-line.
- Surveys were mailed to potential respondents in late May 2003 and a second mailing of questionnaires was completed in July of 2003.

**Sampling**

The mailing lists ('universe') were identified using industry lists from the Greater Cleveland Partnership's ICE Industry Cluster.

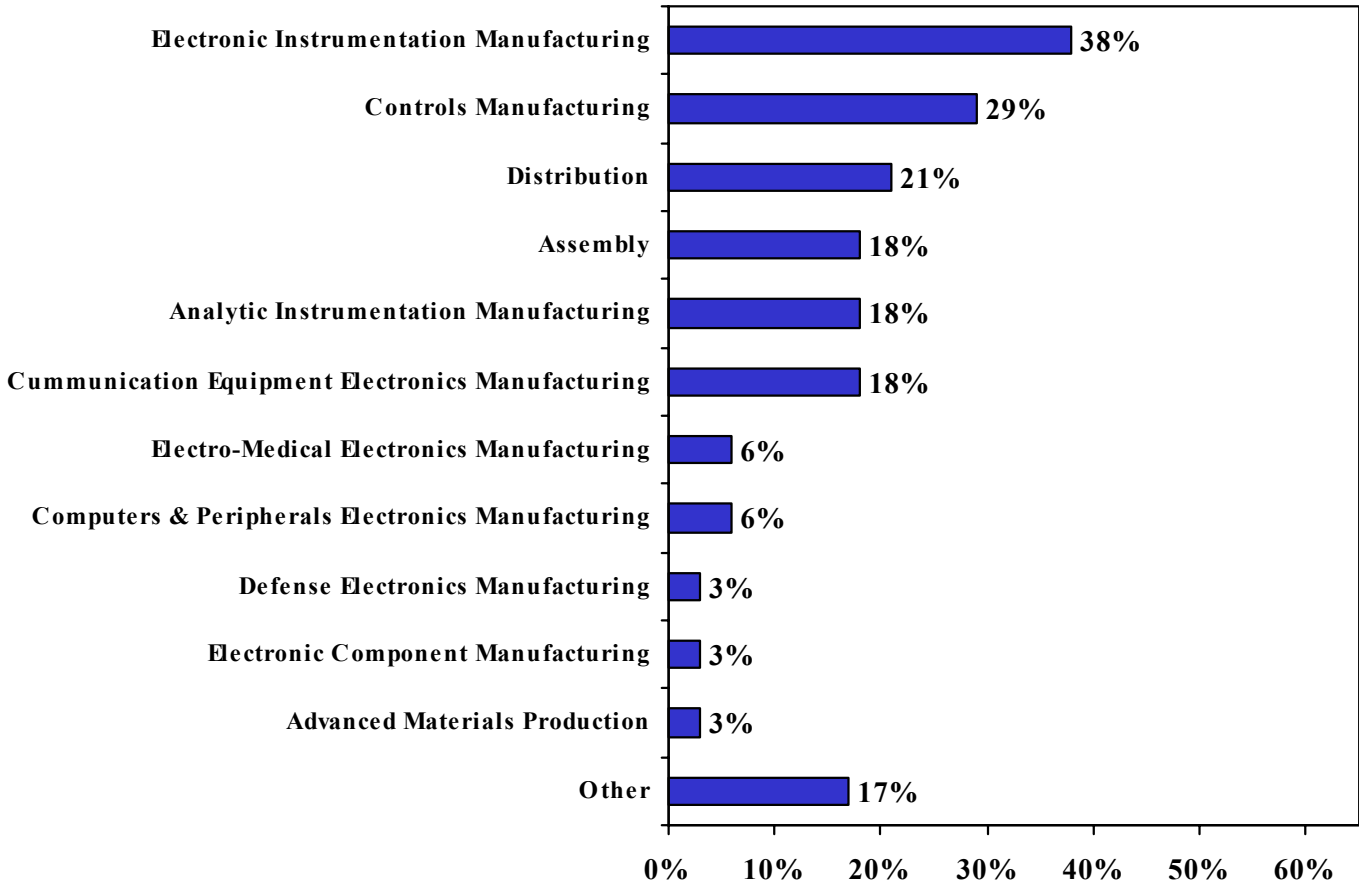
**Sampling Disposition**

Original Universe Size	504
Envelopes Returned Undeliverable	58
Completed Surveys Returned	34
Response Rate	8%
Margin-of-error	+/-16%

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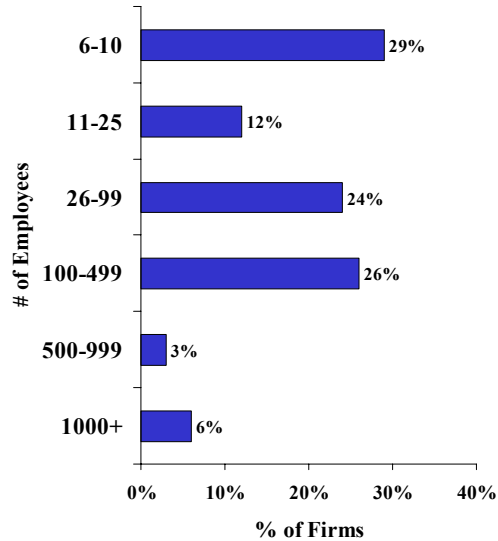
**Figure 1. Industry Sectors  
% Of Sampled Firms**  
(Multiple responses accepted; totals do not add to 100%)



Survey respondents represented numerous industry sectors, with no sector dominating the results. In terms of types of businesses, a large number of firms described themselves as being mainly in *Electronic Instrumentation Manufacturing* (38% of firms). The second most commonly described line of business was *Controls Manufacturing* 29%. *Distribution* (21%) rounded out the top three most common sub-types of ICE firms.

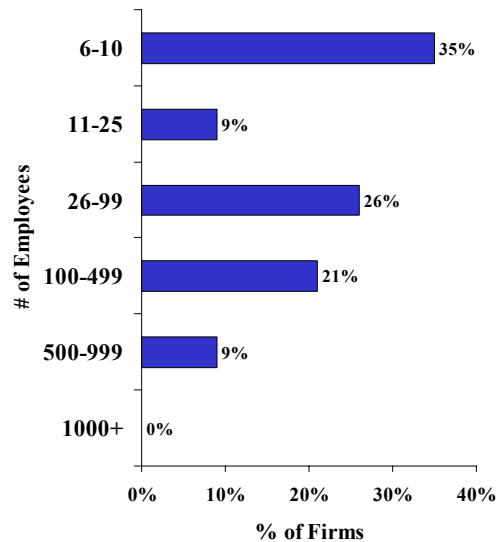
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**Figure 2. Number of Employees  
% Of Sampled Firms (Company-Wide)**



- Median of 48 total employees
- Represents a total of 193,246 employees

**Figure 3. Number of Employees  
% Of Sampled Firms (in Greater Cleveland)**

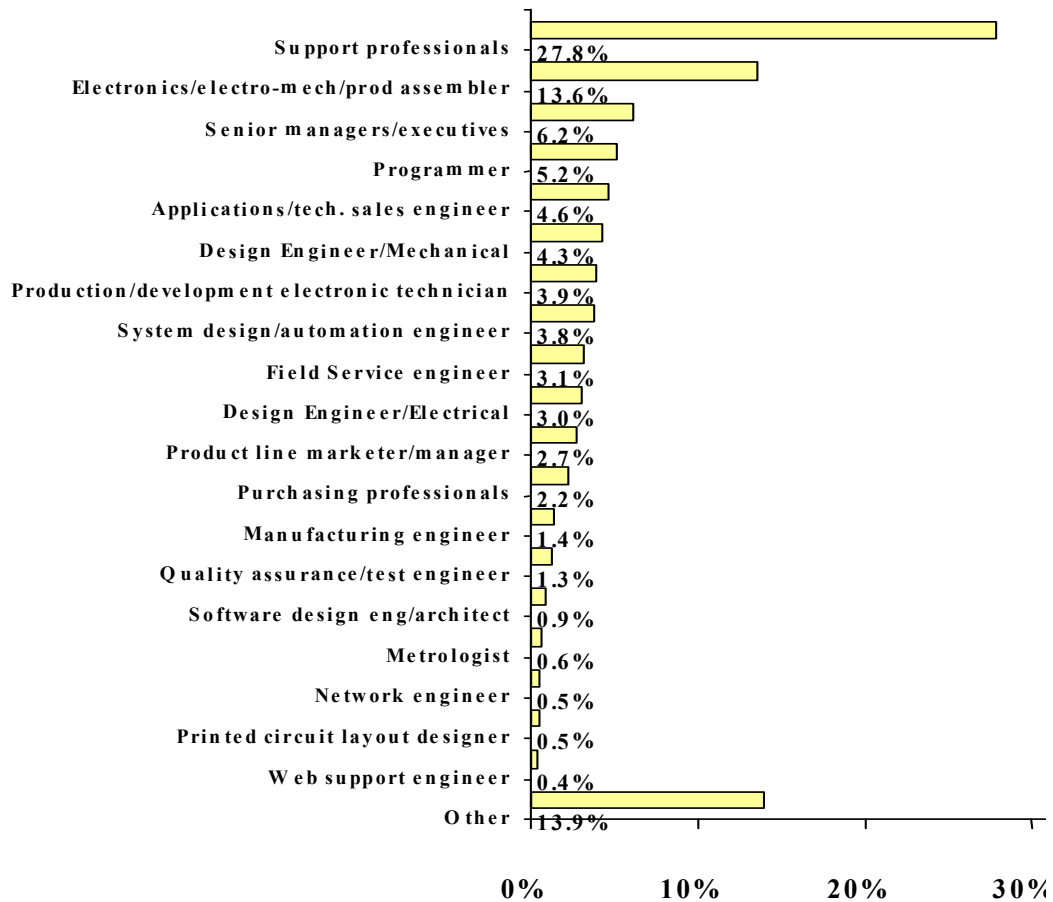


- Median of 29 employees in Greater Cleveland
- Represents 3,948 employees
- For 47 percent of the firms, all of the firm's employees are in the Greater Cleveland area. For 17 percent, fewer than half of their employees work in the Greater Cleveland area.

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**The Composition of the ICE Workforce in Northeast Ohio**

**Figure 4. Staff Composition  
% Of Sampled Firms**

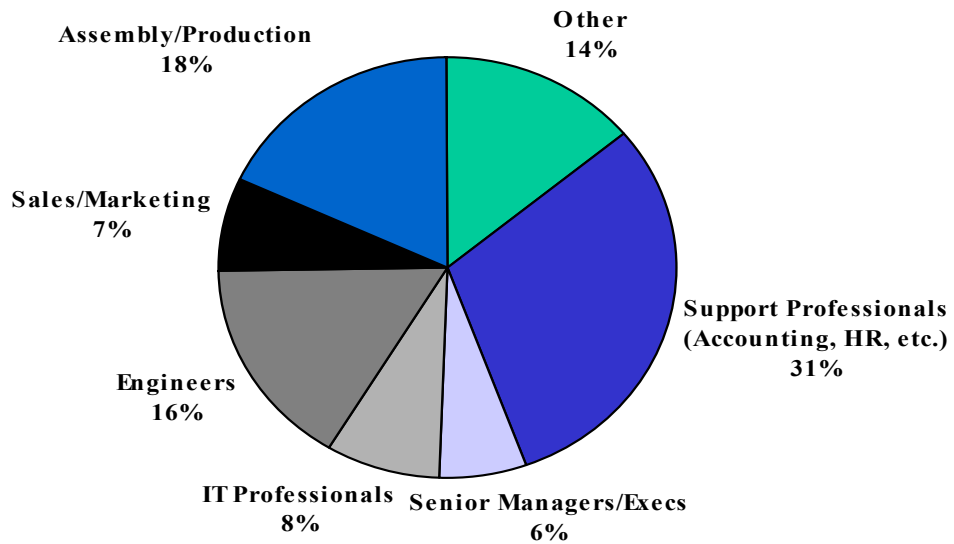


- Approximately 96 percent of all employees were accounted for by these occupations.
- About one-in-four (27.8%) of the positions within ICE firms were classified as ‘support’ (HR, accounting, sales, customer support, etc.). Assembly employment accounted for 13.6 percent of the positions. All of the remaining positions were fewer than 7 percent of the total positions accounted for in this study.

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**Figure 5. Staff Composition**



If all of the positions described on the previous page are re-categorized, all Support Professionals account for almost one-third of all positions, followed by assembly/production workers (18%). Engineers account for 16% of the ICE workforce, and IT professionals account for 8%.

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**2002 Hires**

**Figure 6. ICE Professionals Hired in 2002**  
**% Of all similar ICE Professionals**

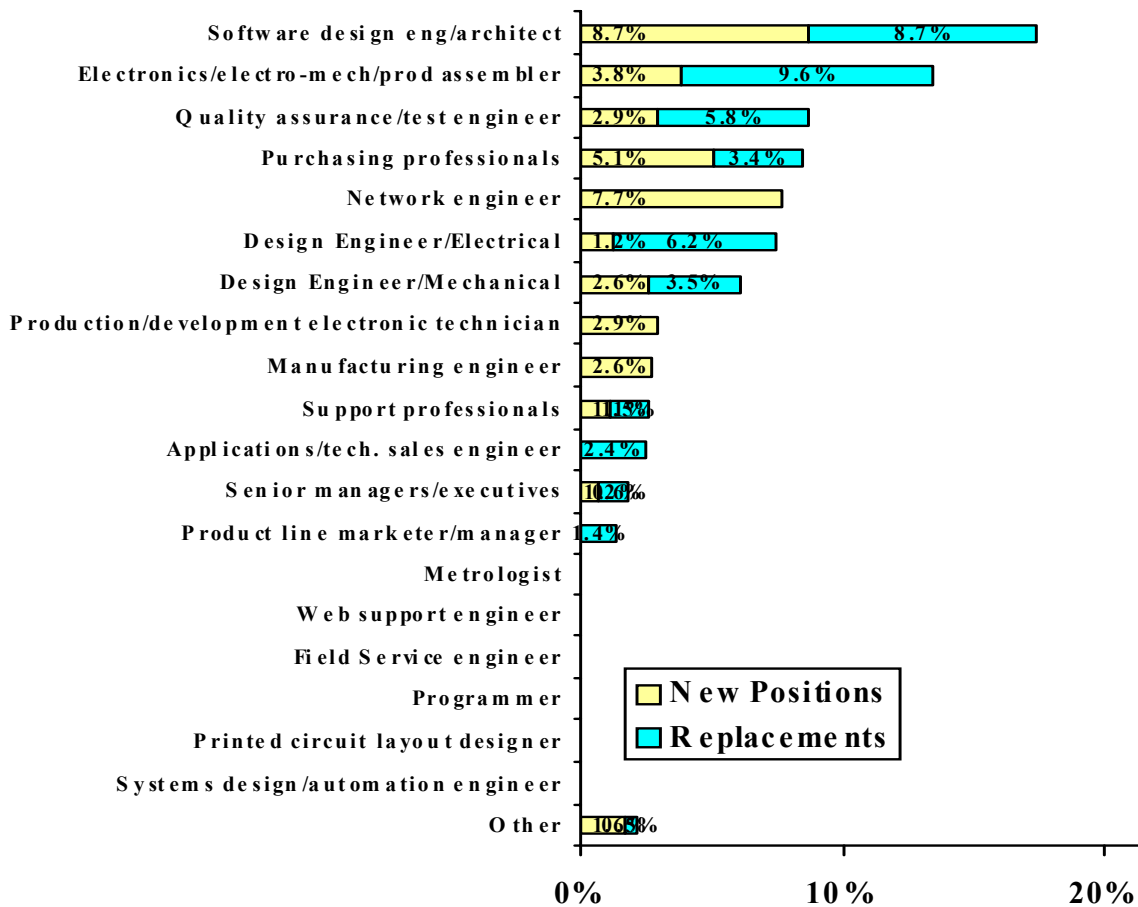


Figure 6 shows the proportion of ICE workers hired in 2002, expressed as a percentage of all ICE professionals of that type. Shown this way, these data highlight those positions showing the highest proportion of ‘churn.’ The figure shows both the proportion of ‘new hires’ (which shows growth) and hires that are to replace existing ICE workers.

- *Software design engineers & architects* were the most frequently hired (17.4% of software/design engineers hired in 2002).
- Assemblers were also in demand in 2002 that category (13.4%).

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**Figure 7. ICE Professionals Hired in 2002  
% Of current employee base**

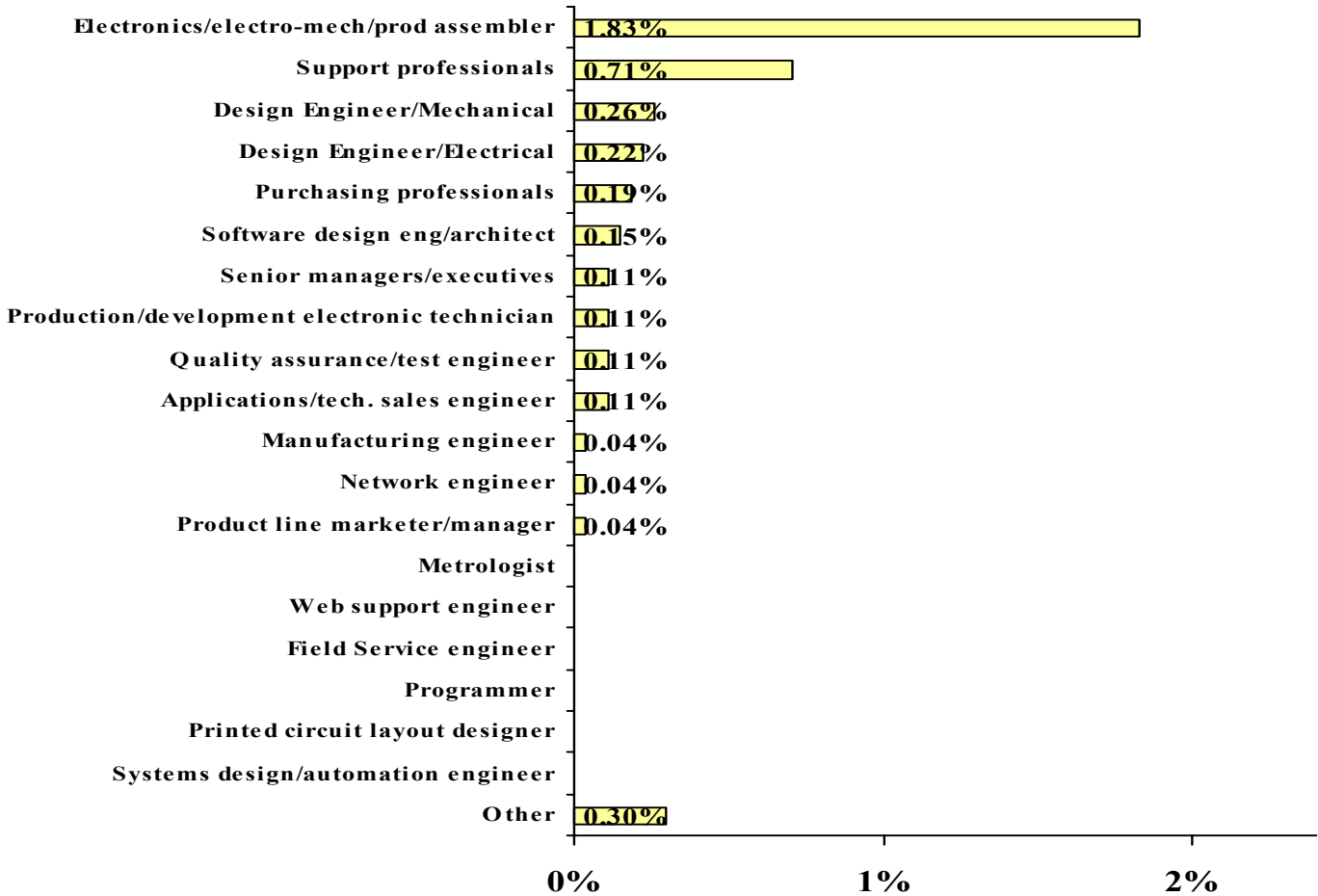


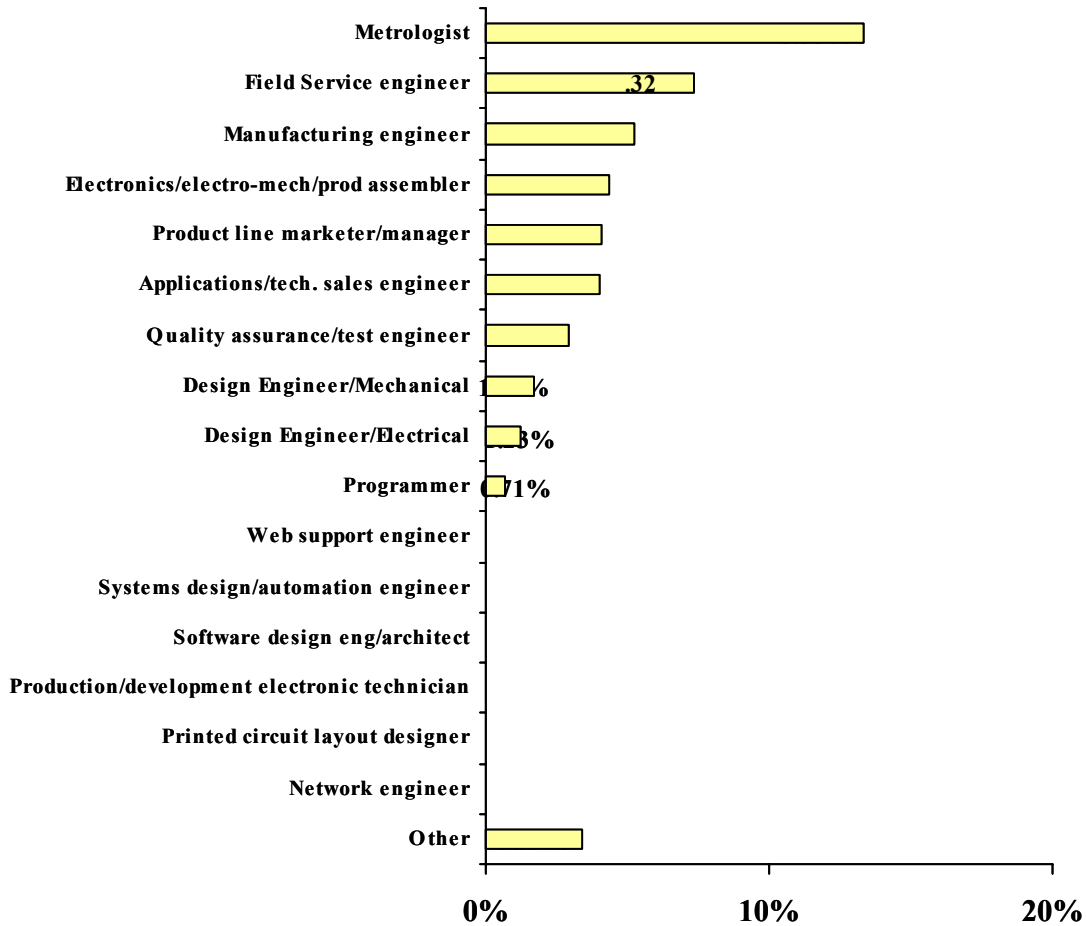
Figure 7 displays the same hiring data on the previous page, but expressed as a percentage of all ICE workers accounted for in this study. It illustrates the types of employees overall, hired in 2002.

- In total, there is a ‘churn rate’ of 3.9% (1.4% new positions and 1.5% replacement positions). That is, 3.9 percent of the total workforce accounted for in this study was hired in 2002. Total churn is the number of employees hired (either new or replacement positions) divided by the total number of employees working in that cluster.
- *Assemblers* represented the greatest proportion of hires in 2002 (1.83%), followed by *support professionals* (.71%). Both *mechanical* (.26%) and *electrical* (.22%) *design engineers* were among the most common types of hires in 2002.

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**2002 Job Openings**

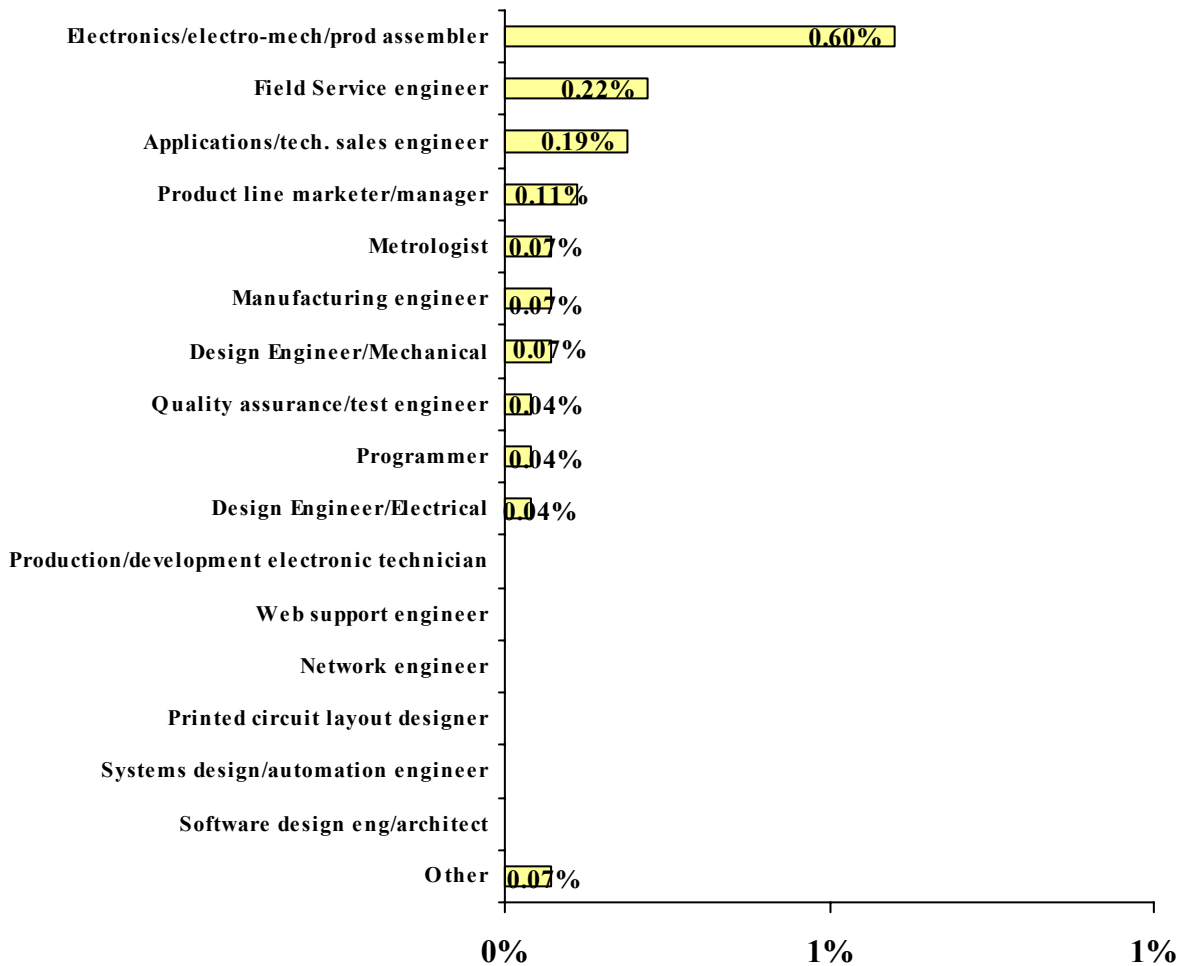
**Figure 8. Current Job Openings  
% Of all similar ICE Professionals**



The proportion of current openings (summer, 2003), expressed as a percentage of all ICE professionals is shown in Figure 8. Metrologist openings have an open-position rate of 13.3%. As indicated in Figure 7, there was no new or replacement hires for those in metrology in 2002 but there were a fair number of openings for such professionals in 2003.

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**Figure 9. Current Full-time ICE Job Openings  
% Of all Employees**



As a percentage of the total current industry workforce, current full-time openings represented 1.5 percent. Within the ICE job market, (.6%) represented positions for *assemblers*. Also in demand were *field service engineers*, *technical sales engineers*, and *product line market managers*.

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**Table 1. Current Northeast Ohio Full-time ICE Job Openings**  
Minimum Educational Levels For Current Openings

	<b>48% of openings</b>	<b>16% of openings</b>	<b>36% of openings</b>
	<i>High School Minimum</i>	<i>Two-Year Degree Minimum</i>	<i>Four-Year Degree Minimum</i>
Applications/tech. sales engineering		✓	✓
Assembly	✓	✓	
Computer Programming			✓
Electrical Design Engineering		✓	
Field service engineering	✓	✓	
Manufacturing engineering			✓
Mechanical Design Engineering		✓	✓
Metrology	✓		✓
Product line marketer/management			✓
Quality assurance/test engineering			✓

Nearly half (48%) of current openings require a minimum of a high school education; 16% of current openings are for those with a minimum of a two-year college degree; 36% of current openings are for those with a minimum of a four-year college degree.

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**Expected Job Openings in 2003**

**Figure 10. Expected Job Openings**  
% Of all similar ICE Professionals in 2003

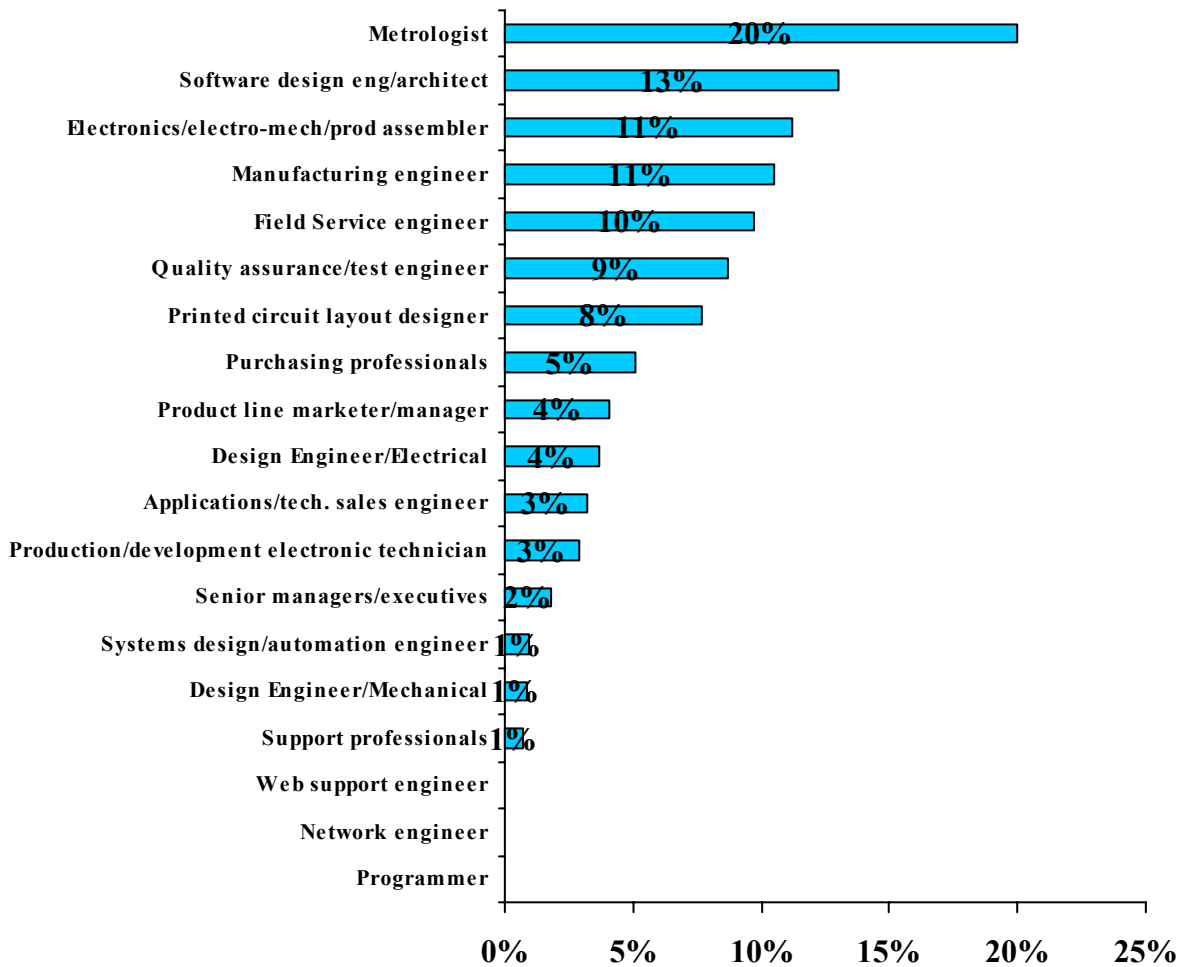
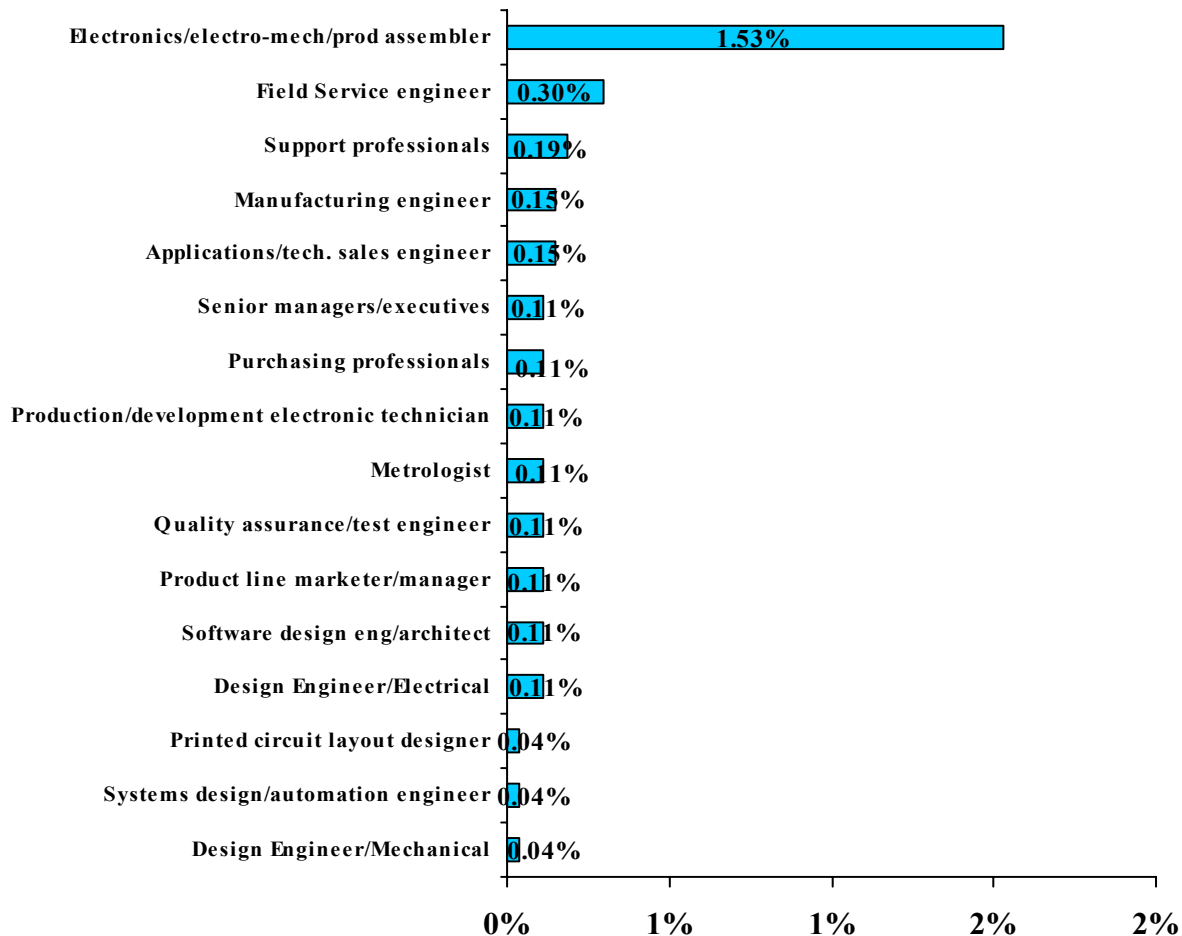


Figure 10 displays information on the expected future openings at ICE firms, expressed as a percentage of all ICE professionals, at the time the survey was conducted. As previously noted there is a strong demand for *metrologists* (20% of all currently filled meteorologist positions). *Software design engineers/architects* were also expected to be in demand in 2003 (13% of current positions).

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**Figure 11. Expected Job Openings**  
% Of all employees in 2003

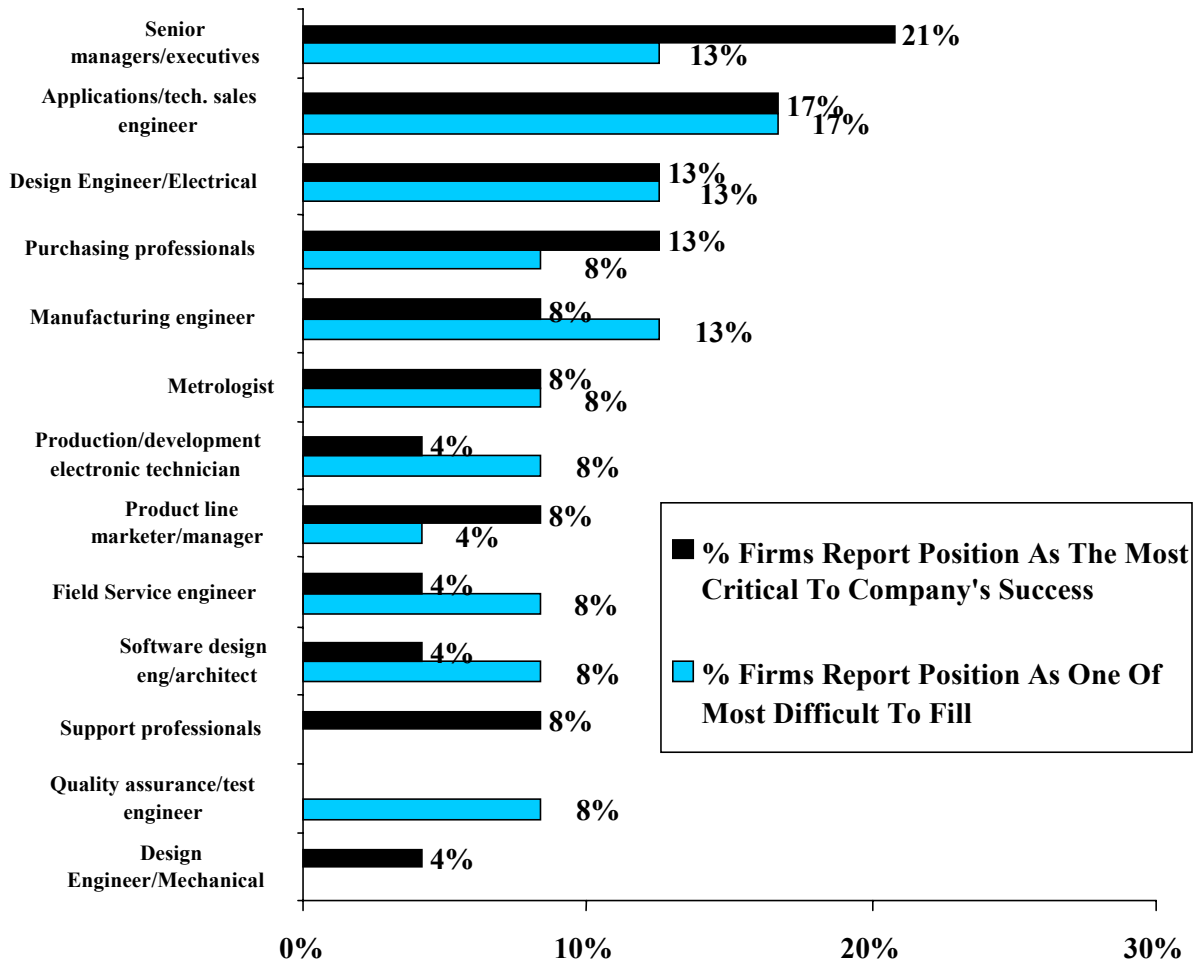


- Expected job openings as a percentage of total ICE workforce amounts to 3.3 percent of the total workforce. About half (1.53%) of those anticipated openings are in assembly. *Field Service Engineers* (.3%) and support professionals (.19%) are expected to be common hires in 2003.
- Note that openings across the engineering disciplines represent 61% of the anticipated openings, even though engineers represent only 16% of the total ICE workforce.

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**Figure 12. Recruiting Issues**  
(Multiple responses accepted; totals do not add to 100%)



Respondents were asked questions on their top five positions which are 1) the most difficult to recruit, and 2) the most critical to their company's success. Positions identified in the survey having both of these factors are important targets for workforce development efforts. The following positions were identified as being both difficult to recruit and critical to many company's success:

- *Senior managers/executives*
- *Applications/technical sales engineers*
- *Electrical Design Engineers*
- *Purchasing professionals*
- *Manufacturing engineers*
- *Metrologists*

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Salary Trends

Figure 13  
Salary Requirements for New Hires  
(Compared to 2002 levels)



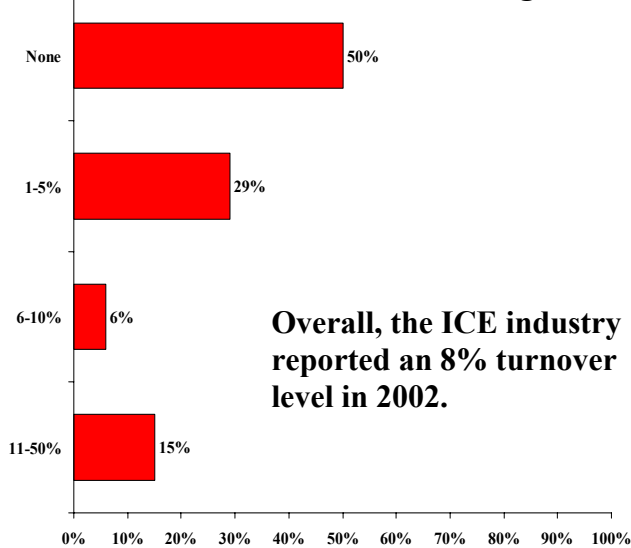
At the time the survey was conducted, the relatively soft labor market had not led to relief in starting salaries, as few respondents (at most 11%) reported lower starting salaries for new entry-level, mid-level or senior-level employees in 2002 as compared to 2001.

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**Staff Turnover and Replacement**

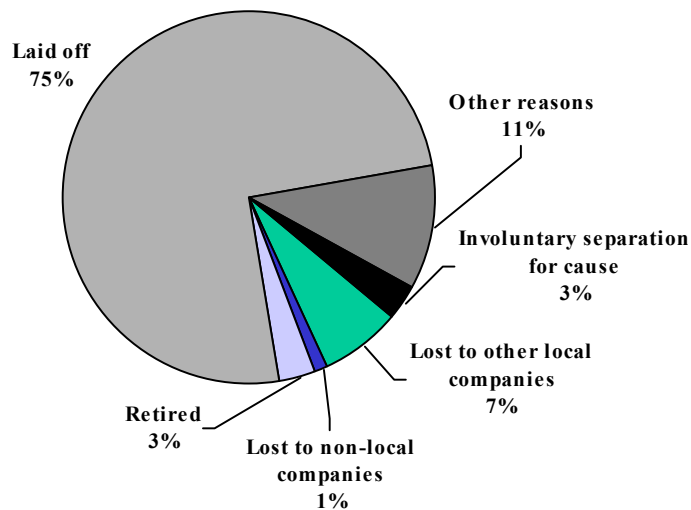
**Figure 14. Amount of Staff Turnover During 2002**



- As shown in Figure 14, half of the firms reported no employee turnover in 2002. Almost one-third reported minimal levels – 1 to 5%; six percent reported moderate levels (6-10%) and 15% of the firms reported relatively high levels of turnover (11-50%).

**Figure 15. Reasons for Staff Turnover During 2002**

Percent of Separations due to...



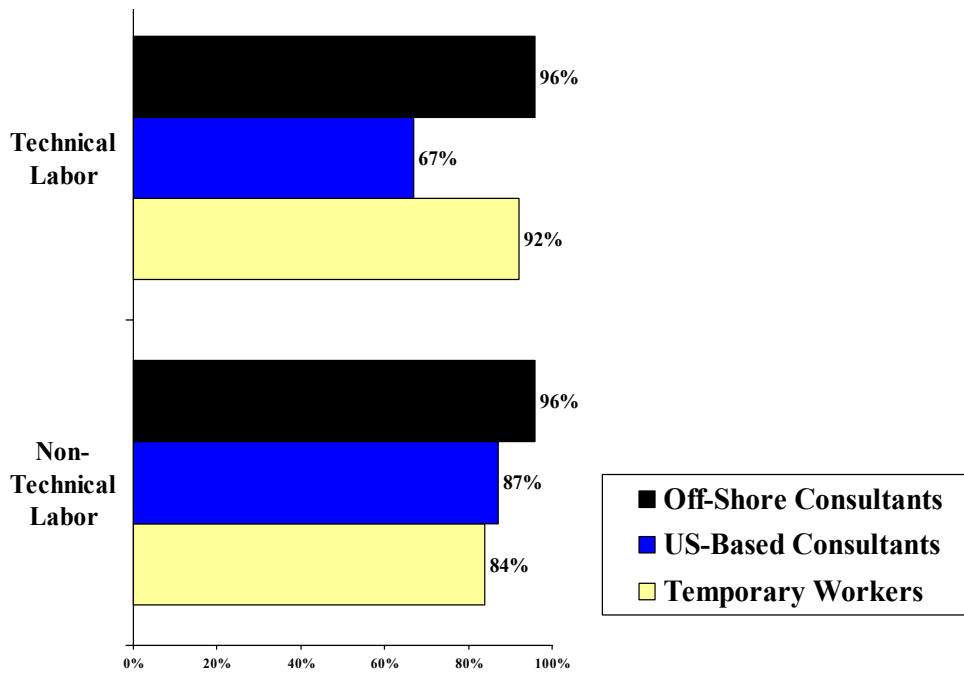
The majority of the turnover was due to layoffs (75%).

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**Non-Employee Labor**

**Figure 16. Supply of Workforce**  
What percentage of company's technical/non technical labor was not met by..... in 2002?

**% Of Companies That Outsource '0%' of Labor**



For each of these out-sourcing categories, most companies have retained all services 'in-house.' Those firms that do out-source tend to contract out a sizeable amount of their work. In all instances, the minimum percentage of labor that was outsourced was 25% (not shown).

**Talent Development**

**Internship/Co-Op Offerings**

- Of firms sampled, 54 percent offer at least one internship, summer job, or apprenticeship for high school or college students. However, on average, firms offer only 1 such position per year.
- College students are most likely to be interns and the most common offering was for 'technical' paid internships (83% of positions).
- Internship/summer job/apprenticeships represent 1% of the total workforce reported in this study.
- We estimated that the Cleveland area offers approximately 200 such workforce development positions within the ICE industry.

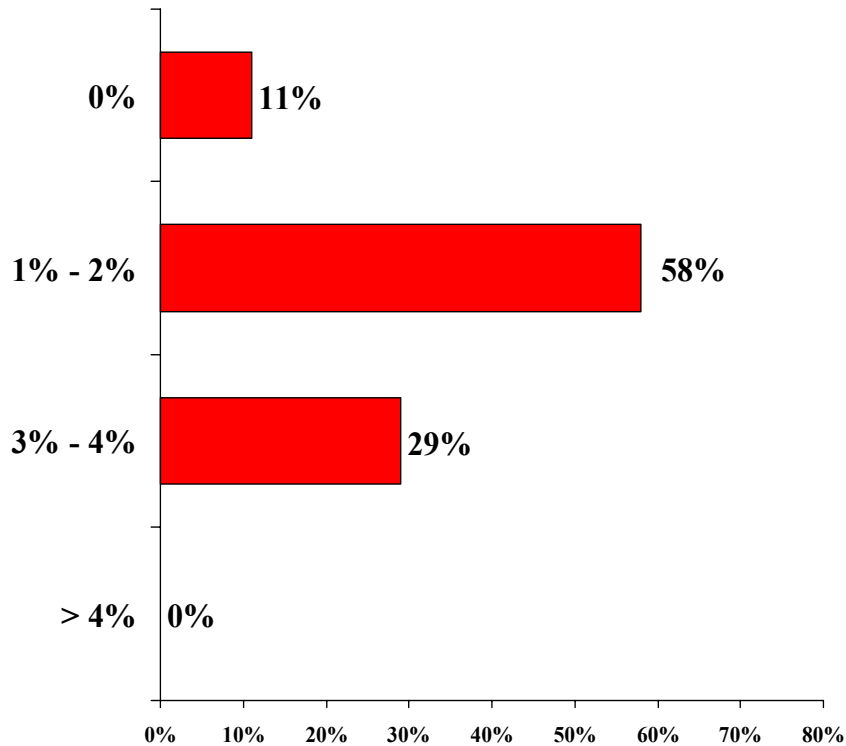
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**Training of Incumbent Employees**

One-fourth of the firms have at least one (part-time or full-time) staff dedicated to the training of employees. Training specialists within ICE firms represent .05% of the total workforce reported in this study.

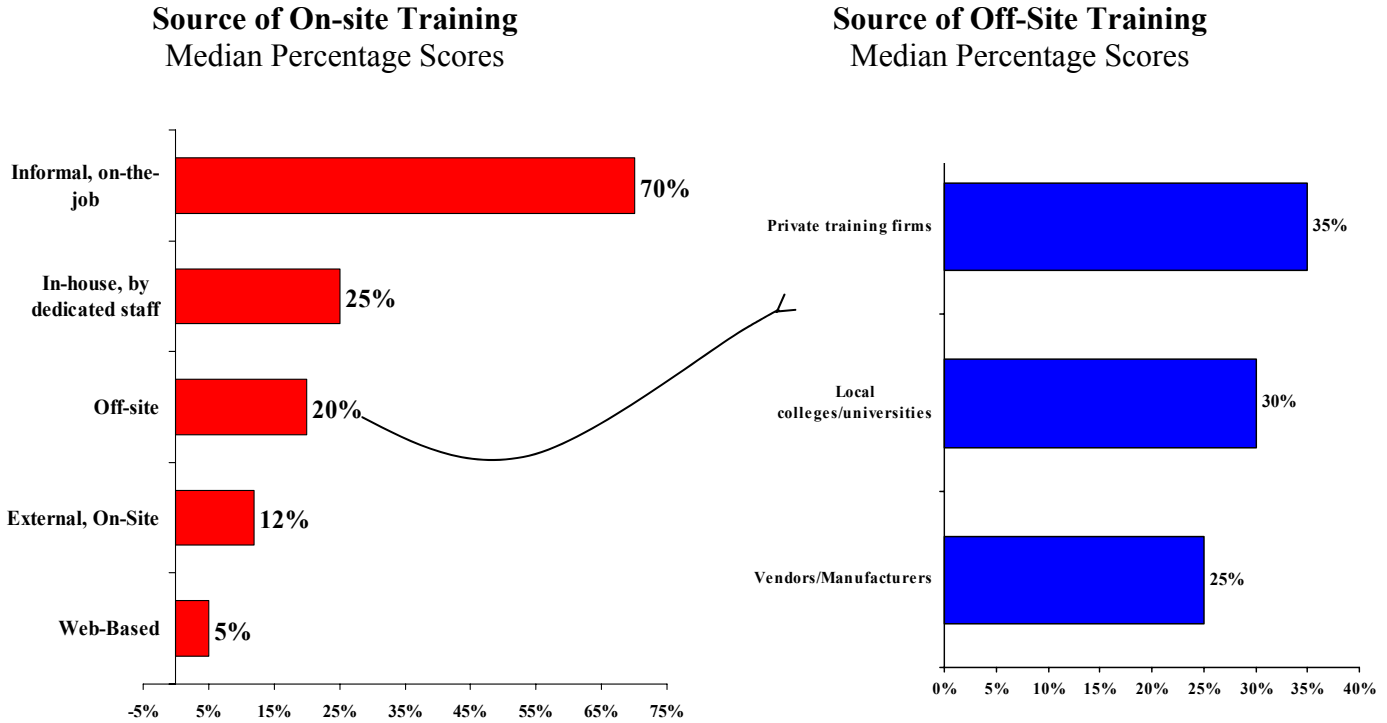
**Figure 17.  
Percent of Payroll Dedicated  
to Skills Training of Incumbent Workers**



The majority of firms (58%) reported allocating approximately 1 percent to 2 percent of their total payroll to skills training for the employees. The benchmark for world-class companies is 4 percent. None of the sampled firms met that benchmark, and on average, these companies fell far short.

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**Figure 18. Sources of Skills Training**

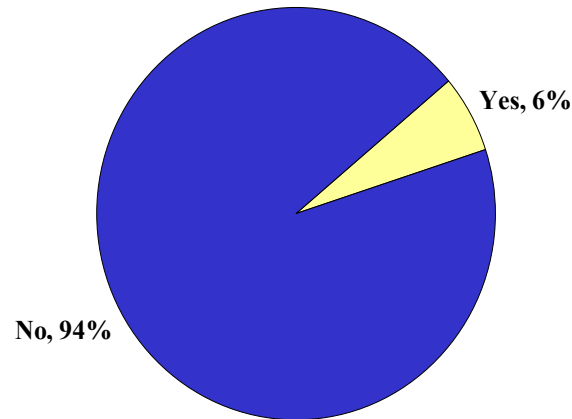


The predominate source of skills training for employees is via ‘informal, on-the-job’ training (median of 70% for all firms). One quarter of the firms used in-house training specialists. ‘Off-site’ training was slightly less utilized (20% of efforts), followed by ‘external training on-site’ (12%) and web-based training (5%).

Off-site training was somewhat evenly split among ‘private training firms’ (median of 35% of training efforts), ‘local colleges/universities’ (30%) and vendors and manufacturers (25%).

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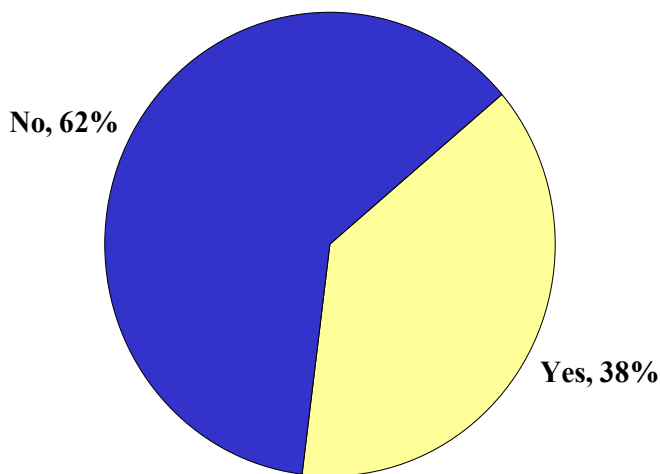
**Figure 19. Shortage of Local Training Programs?**



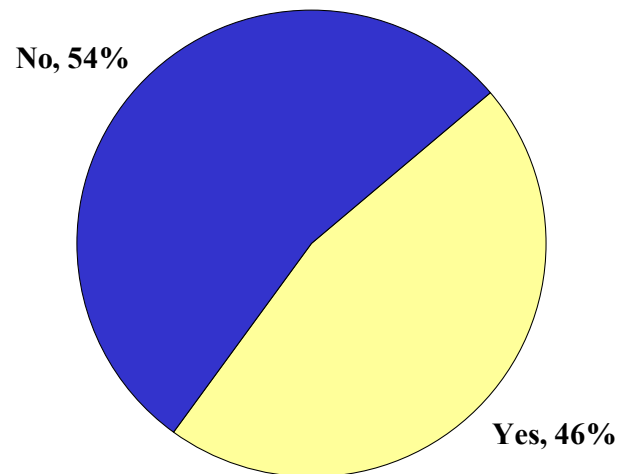
Fortunately, as shown in Figure 19, very few firms reported an inability to find *local* training classes. Two firms noted there was a shortage of local classes on Metrology.

**Figure 20. Participation in Workforce Development Initiatives**

**Request Contact by GCGA  
Regarding  
Company-Specific Workforce  
Programs**



**Request Contact by GCGA  
Regarding  
ICE Cluster Initiatives**



Names and contact information have been provided under separate cover.