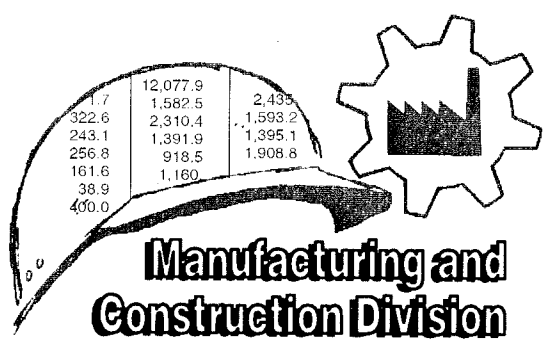
Working Papers

Industrial and Construction Statistics



Manufacturing and Construction Division

Bureau of the Census

Technology

PROBLEMS IN DEFINING HIGH-TECHNOLOGY INDUSTRIES

By

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Presented at Informal Workshop on Industrial Statistics held by the Members of Working Party No. 9 (Industrial Statistics) of the Industry Committee, Organization for Economic Cooperation and Development, Paris, France
November 4, 1986

PROBLEMS IN DEFINING HIGH-TECHNOLOGY INDUSTRIES

Introduction

1. A popular term in recent years is high-tech. Many studies have been done that addressed issues about high-tech industries and related concepts such as research and development (R&D) expenditures, scientist and engineer employment and training, and economic growth and competitiveness. A wide variety of definitions for high-tech industries have been used in these studies.

2. Interest in high-tech as a subset of all industries stems from a wide variety of issues. Chief among these are:

i) Technological advancement is generally viewed as a necessary condition for an increasing standard of living and economic well being.

ii) Technological advancement is seen as a necessary condition for increasing productivity and competitiveness. The competitiveness concern includes both the international markets for goods that embody high levels of technology as well as more cost-efficient ways to produce other goods so they can be competitively priced.

iii) Some view high-tech industries as strategic in that they potentially contribute more to national economic growth and welfare than other industries with similar levels of activity. Proponents of this view identify three characteristics of such an industry: first, it is technically advanced; second, its growth offers wide spread benefits; and third, these benefits accrue disproportionately within the Nation's borders.

iv) High-tech industries are viewed as strategic from a national defense standpoint.

v) High-tech industries are seen as the growth industries and industries of the future. Thus, there is a lot of interest on the part of local and state authorities in getting such industries to locate in their area. There also is strong interest from labor and education people because of implications about jobs, wages, and training needs.

3. Results of the many studies are dependent on the definition of high-tech used in the study. And results from the studies are not additive because different definitions are used. This has caused many to say we should have a single, standard definition for high-tech industries.

Existing Definitions

4. While a variety of definitions for high-tech industries have been used, all include some concept of research intensity. This generally involves a measure of R&D expenditures such as R&D expenditures as a percent of net sales.

The level above which to classify an industry as high-tech is usually arbitrarily set by the researcher. Some use everything above the average and some only include those industries that are "significantly" above the average.

5. A variation of this measure which has become quite popular is to use an input-output model to develop a total technology intensity estimate for each industry. In this measure, only applied R&D expenditures are used and the technology applied in the production of intermediate inputs (indirect), as well as the technology directly applied by the final producer is used. For example, an aircraft gets credit for applied R&D in the computer industry which supplied the avionics, as well as the R&D of the airfoil design team.

6. A second measure of research intensity that has been used, generally in connection with R&D expenditures, is proportion of scientists and engineers, or scientists, engineers, and technical support people employed in the industry. Again, the level above which to classify an industry as high-tech or how to combine the two measures in a classification scheme is arbitrarily chosen.

7. Other measures that have been used in combination with research intensity to define high-tech industries include:

i) The nature of the product of the industry.

ii) More rapid growth in employment than the all-industry average.

iii) High rates of capital investment.

8. Less rigorous definitions have been used. One example is "A high technology industry is a group of firms, producing similar or related products, that include a high proportion of high technology firms," with high technology firms defined as "companies that are engaged in the design, development, and introduction of new products and/or innovative manufacturing processes through the systematic application of scientific and technical knowledge."

9. The number of high-tech industries varies significantly depending on what definition is used. Using the standard industrial classification categories, the number of 3-digit level industries defined as high-tech has varied from as few as 6 to as many as 48 under different definitions.

Problems With Definitions

10. Using the concept of research intensity as the definition, or some part of the definition, serves some of the data users but not all of them. The analysts addressing issues such as the rate of technological change or the ability to continually develop new products that embody high levels of technology and improve living standards or competitive position are reasonably well served with measures that quantify the concept of research intensity.

11. Those who want to address issues of potential productivity improvements on the ability to improve competitive position by reducing production costs need other definitions and measures. For analysis of these issues, it is necessary to know what level of technology is being used in the production process and how that is changing over time. Measures, such as R&D expenditures, do not measure changes in the production process because a large majority of R&D expenditures are for production development rather than process improvement and while some products end up in production processes, many are for final consumption.

12. In essence, the existing definitions classify industries as high-tech if they produce products that have embodied high levels of research. This is satisfactory for many products that are used in some way to improve productivity but also includes products such as perfumes and cosmetics that are not expected to have an impact on productivity. On the other hand, an industry that embodies high levels of technology in their production processes may not be defined as high-tech. Thus, research intensity is not a sufficient concept for identifying those industries that should be classified as high-tech when the concept we are trying to measure is higher productivity and improved competitiveness.

Data Needs

13. Defining and classifying industries require data, both for understanding the implications of a definition and for making classification decisions. The availability of R&D expenditures data has been a major reason why research intensity has been the predominant concept used in defining high-tech industries. The lack of data on other possible variables is the primary reason a more sufficient definition has not been developed.

14. One concept that has been suggested for defining high-tech industries is the stock of technology. The problem, of course, is that this is a hard concept to measure. We do a survey in the United States once each 5 years called Textile Machinery in Place that is a measure of the stock of technology in that industry (see Annex A). People knowledgeable about the industry, its technology and production processes can translate these data into implications for cost, productivity, and competitiveness. Doing something like this for several industries would be a major task.

15. A second idea we have for some information on the stock of technology, how it is changing and why, and what difference it makes, is a survey of the use of high technology manufacturing processes. An early draft of a form for the first phase and a letter used to send it to a wide array of people for comment is attached as Annex B. Comments have been very favorable and have encouraged us to add a few questions to the form for related information. Suggested additions included age of plant and equipment, type of firm, indication of extent of use, and indication of software used. Some of these can be included on this form and others covered as part of planned Phase II, detailed follow-on surveys for each technology or related group of technologies.

16. Another way to help measure the change in the stock of technology would be to collect information on the types of technology being purchased with capital investment funds. This also would be a difficult survey activity. Other information on retirements and discards and the level of investment spending should be useful as well.

17. One final data improvement also should be considered. That would be to have better information on R&D expenditures for process technology. We now only try to collect an indication of what share of R&D expenditures is to improve production processes.

18. We believe it is very important to develop a more comprehensive set of data that links capital investment, technology, productivity, and competitiveness. Developing more adequate, and perhaps a standard definition for high-tech industries, would be an important move in this direction.

19. We are anxious to hear about similar work in other countries, other ideas for defining high-tech, and the types of data being collected for these purposes.

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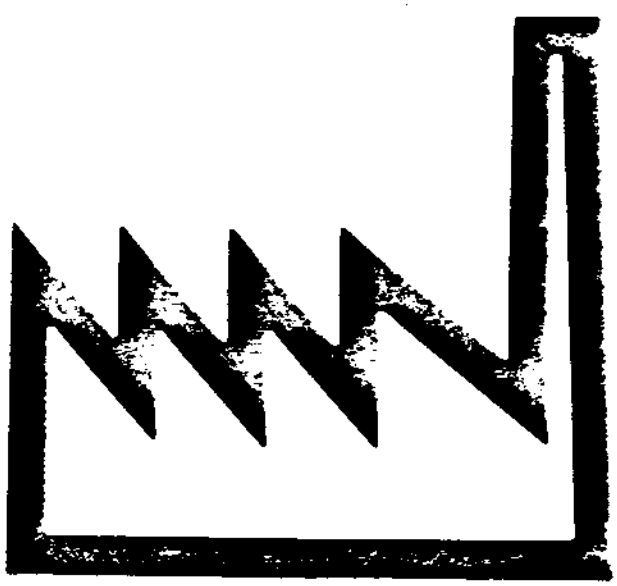
1982 Census of Manufactures

MC82-S-3

SUBJECT SERIES

Textile Machinery In Place



U.S. Department of Commerce
BUREAU OF THE CENSUS

Textile Machinery in Place

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EXPLANATORY TEXT

GENERAL

This report supplements the 1982 Census of Manufactures data shown for SIC Major Group 22, Textile Mill Products, in the industry reports series. The data included in this report were collected in an independent survey through a mail canvass on Census Form MC-22Z, Textile Machinery in Place as of June 30, 1983, as part of the 1982 Census of Manufactures.

SCOPE OF SURVEY

The manufacturing establishments reporting in this survey are defined as a single physical location where manufacturing operations are performed (e.g., a factory, mill, or plant). They were selected from the 1982 Census of Manufactures mailing panel for specific textile industries as defined and structured in the 1972 edition of the Standard Industrial Classification (SIC) Manual[1], published by the Office of Management and Budget, Executive Office of the President. The specific industries included cover the major textile operations, as follows: yarn spinning (SIC's 2281 and 2283); yarn texturing and throwing (SIC 2282); weaving (SIC's 2211, 2221, 2231, and 2241); knitting (SIC's 2251, 2252, 2253, 2254, 2257, 2258, and 2259); yarn and fabric finishing (SIC's 2261, 2262, and 2269); tire cord and tire cord fabric (SIC 2296); nonwoven fabrics (SIC 2297); and carpet and rugs (SIC's 2271, 2272, and 2279). Since a portion of textured yarn is also produced by chemical companies manufacturing filament yarn (SIC's 2823 and 2824), respondents were also selected from these operations. However, the machinery in place at coated fabric plants (SIC 2295) was excluded from this survey.

METHOD OF OPERATION

The textile industries are characterized by several major types of business activities: manufacturers, contractors, jobbers, converters, wholesalers, and piece-goods dealers.

The "manufacturer" purchases materials, employs production workers in his own plant to produce the product, and sells the product. In effect, the establishment performs all of the usual manufacturing functions.

The "contractor" employs production workers in his own establishment to process materials owned by other companies (independent contractors) or supplied by other establishments of the same company (multiplant company contractor), makes products to specification, and is not involved in the sale of the finished product.

The "jobber", "converter", "wholesaler", and "piece-goods dealer" primarily perform only the entrepreneurial functions of the textile business, such as buying raw materials, designing and preparing samples, arranging for the manufacture of products from owned materials with contractor, and marketing the finished product.

The reporting establishments were asked to indicate their type of business (manufacturer, contractor, or jobber) and the kinds of operations (spinning, weaving, etc.) performed at each manufacturing location. Since there is a large degree of integrated or vertical operations within the establishments in the textile industries, each respondent received a complete copy of the report form, including all machinery descriptions collected in this report. This gave the respondent the opportunity to report the machinery in place of all operations performed at the plant location. The information concerning the type of business and kind of operation of the respondent was then cross-checked against the type of machinery reported by that respondent to ensure a complete and full report from each reporting unit. Basically, the majority of the machinery-in-place data shown in this report are located at manufacturing and contracting establishments. In addition, jobbers within the knitting industries were mailed report forms since they are considered within the scope of the census of manufactures. All other jobbers, wholesalers, converters, and piece-goods dealers were excluded from the mailing panel of this survey.

All respondents were asked to report the number of machines in place. For the purpose of this report, "machines in place" includes all machinery set up in operating positions even though the machinery may have been idle on June 30, 1983. In addition, the respondents were also asked to include sample machinery.

SURVEY COVERAGE

As a means of evaluating the coverage of this information, the employment figures for those establishments responding to our survey were tabulated by four-digit SIC industries in which the responding establishments are classified. The total employment figure of the reporting establishments of each four-digit SIC industry was then compared to the total employment figure of the respective four-digit SIC industry as shown in the 1982 Census of Manufactures preliminary industry reports. The figures presented in this report are simple aggregates of reported data from companies representing approximately 90 percent of total employment in the industries covered by this survey. The reporting percentage shown above may be slightly higher or lower in some cases as a result of plants that were out of scope of this survey or out of business and had sold or dismantled their equipment during 1983. These plants were counted as reporting establishments and their employment data were used in the computation of the reporting percentage. Also, an attempt was made to contact any known successors to the plants that went out of business during 1983. Conversely, several multiplant companies had new plants come into business during 1983.

[1]**Standard Industrial Classification Manual: 1972.** For sale by Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402. Stock No. 041-001-00066-6. **1977 Supplement.** Stock No. 003-005-00176-0.

Although the data for the successor establishments and new plants are included in the tables, they had no employees in 1982 and, therefore, could not be included in the reporting percentage.

CENSUS DISCLOSURE RULES

In accordance with Federal law governing census reports, no data are published that would disclose data for an individual establishment or company. However, the suppressed data are included in the higher level totals.

COMPARABLE CURRENT INDUSTRIAL REPORTS SERIES DATA

The data for selected types of machinery in place are also collected in the Current Industrial Reports (CIR) series of the Census Bureau. Reference is made in footnotes of each table where applicable to indicate the appropriate CIR series containing the comparable machinery-in-place data.

COMPARABLE PRIOR CENSUS OF MANUFACTURES DATA

Similar textile machinery-in-place data were shown in previous census of manufactures publications. Volume I, Subject Statistics, of the 1977, 1972, 1967, 1963, and 1958 Censuses of Manufactures included textile machinery-in-place data for selected years between 1954 and 1965. Where applicable, selected comparable figures from these publications are shown in the tables of this report.

SUMMARY OF FINDINGS

The data from the 1983 survey indicate a trend toward faster, more efficient machinery when compared to the 1978 data. For example, for cotton system spinning equipment, ring spindles are down from 17,182,204 in 1978 to 14,760,961 in 1982, while ringless spindles in place increased from 153,778 in 1978 to 316,196 in 1983. Similarly, shuttle-type and broad fabric weaving looms decreased from 261,904 in 1978 to 137,392 looms in 1983 while the faster shuttleless type looms, such as waterjet, airjet, etc., increased from 34,217 looms in 1978 to 53,798 looms in 1983. This shift to the faster, more efficient looms has allowed the companies to maintain the same level of production while the total number of looms decreased by 32 percent.

These data also reflect some of the changes in fashion which have taken place. For example, the data on knitting machines in place show that from 1978 to 1983, the number of double knit machines declined from 8,266 to 3,377. During the same time, circular spring needle machines which produce among other things, the cloth for sweat shirts and some jogging suits increased from 2,423 to 4,796.

MICROFICHE AND COMPUTER TAPES

All the data in this report are available on microfiche. Selected data from the 1982 Census of Manufactures are also available on computer tape.

In addition to selected published data being on computer tape, one major data series, the location of manufacturing plants, will be available only on computer tape. This series presents the number of establishments by employment size class by four-digit SIC industry codes for States, counties, and places of 2,500 inhabitants or more. These data are available for both State and county by industry, and State and place by industry.

Microfiche reports are sold by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402. Computer tapes are sold by the Data User Services Division, Customer Services (Tapes), Bureau of the Census, Washington, D.C. 20233.

SPECIAL TABULATIONS

Special tabulations of data collected in the 1982 Census of Manufactures may be obtained on computer tape or in tabular form. The data will be in summary form and subject to the same rules prohibiting disclosure of confidential information (including name, address, kind of business, or other data for individual business establishments or companies) as are the regular publications.

Special tabulations are prepared on a cost basis. A request for a cost estimate, as well as exact specifications on the type and format of the data to be provided, should be directed to the Chief, Industry Division, Bureau of the Census, Washington, D.C. 20233.

ABBREVIATIONS AND SYMBOLS

The following abbreviations and symbols are used in this publication:

- Represents zero.
- (D) Withheld to avoid disclosing data for individual companies; data are included in higher level totals.
- (NA) Not available.
- (S) Withheld because estimate did not meet publication standards on the basis of either the response rate or a consistency review.
- r Revised.
- SIC Standard Industrial Classification.

Table 1. Cotton System Machinery in Place for Preparation of Cotton and Manmade Fiber and Spun Yarn: June 30, 1983 and June 30, 1978

[Data are aggregates of reported data from companies representing approximately 90 percent of total employment in industries covered by survey. For meaning of abbreviations and symbols, see introductory text]

Type of machinery	June 30, 1983	June 30, 1978
Automated bale feeding machines ..... number...	843	376
Automated blending machines ..... do...	2 313	2 504
Pickers ..... do...	888	1 614
Cards ..... do...	18 884	30 371
Chute fed ..... do...	12 252	9 561
Direct fed ..... do...	7 632	20 820
Other ..... do...		
Drawing ..... deliveries...	18 560	70 077
Combers ..... do...	4 898	6 063
Roving machinery spindles ..... number...	414 971	839 332
Spinning spindles[1]:		
Ring ..... do...	14 780 881	17 182 204
1 3/8 inches or less ..... do...	723 229	1 236 714
1 7/16 through 1 3/4 inches ..... do...	1 613 502	2 291 870
1 13/16 through 2 1/4 inches ..... do...	8 540 920	10 115 128
2 5/16 inches or more ..... do...	2 883 310	3 538 492
Ringless ..... producing positions...	316 198	153 778
Rotor ..... do...	250 040	146 012
Self cleaning ..... do...	137 828	
1 3/4 inches or less ..... do...	(D)	
1 13/16 through 2 3/4 inches ..... do...	66 754	89 161
2 13/16 inches or more ..... do...	(D)	
Spinning spindles[1]—Con.		
Ringless—Con.		
Rotor—Con.		
Other ..... producing positions...	112 214	
1 3/4 inches or less ..... do...	16 618	
1 13/16 through 2 3/4 inches ..... do...	86 082	85 661
2 13/16 inches or more ..... do...	9 536	
Other ..... do...	86 186	8 786
Automatic spinning doffers ..... number...	8 510	(NA)
Doubling and twisting spindles:		
Ring spindles ..... do...	1 083 387	1 749 281
4 inches or less ..... do...	674 844	1 106 543
More than 4 inches ..... do...	408 543	643 718
Two-for-one twisting spindles ..... do...	132 838	(NA)
Throwing spindles[2] ..... do...	117 995	284 038
Winders and spoolers ..... producing positions...	880 358	617 839
Automatic ..... do...	282 454	322 085
Manual ..... do...	287 804	295 754

Note: Data are collected on a monthly basis and published in Current Industrial Report M22P, Consumption on the Cotton System and Stocks.

[1]Excludes spindles operated on "American" and other new systems for spinning uncut top; see table 4.
[2]Includes up-twisters of either conventional or two-for-one type.

Table 2. Cotton System Spinning Spindles in Place by Geographic Area: June 30, 1983 and June 30, 1978

[Data are aggregates of reported data from companies representing approximately 90 percent of total employment in industries covered by survey. For meaning of abbreviations and symbols, see introductory text]

Geographic area	June 30, 1983		June 30, 1978	
	Ring spindles (number)	Ringless spindles (producing positions)	Ring spindles (number)	Ringless spindles (producing positions)
United States	14 780 881	316 198	17 182 284	153 778
Cotton growing States[1]	14 556 328	306 995	16 833 778	(D)
Alabama	1 453 910	21 188	1 776 375	28 832
Georgia	1 898 192	48 010	2 322 284	25 280
North Carolina	5 115 148	126 641	5 802 012	57 357
South Carolina	5 077 436	72 462	6 031 980	39 864
Tennessee	422 698	9 570	451 718	4 802
Texas	130 573	10 982	180 858	3 800
Virginia	802 896	(D)	895 204	2 400
Other States	85 474	(D)	89 591	(D)
New England[2]	137 368	10 201	222 410	(D)
Rest of United States	87 277		28 018	

[1]Includes Virginia, North Carolina, South Carolina, Georgia, Tennessee, Texas, Alabama, Missouri, Mississippi, Arkansas, Kentucky, Louisiana, Oklahoma, New Mexico, Arizona, California, and Florida.
[2]Includes Maine, New Hampshire, Vermont, Rhode Island, Connecticut, and Massachusetts.

Table 3. Cotton System Spinning Spindles in Place by Type of Mill: June 30, 1983 and June 30, 1978

[Data are aggregates of reported data from companies representing approximately 90 percent of total employment in industries covered by survey. For meaning of abbreviations and symbols, see introductory text]

Type of mill	June 30, 1983		June 30, 1978	
	Ring spindles (number)	Ringless spindles (producing positions)	Ring spindles (number)	Ringless spindles (producing positions)
All industries	14 769 961	916 196	17 182 394	163 776
Weaving mills, cotton (industry 2211)	4 109 251	119 602	4 712 214	49 262
Weaving mills, manmade fiber and silk (industry 2221)	5 383 122	45 506	8 204 232	21 712
Yarn mills, except wool (industry 2281)	4 793 730	119 454	5 344 030	72 012
All other mills	474 858	91 634	821 728	10 792

Table 4. Woolen and Worsted System Machinery in Place, Including Midfiber: June 30, 1983 and June 30, 1978

[Data are aggregates of reported data from companies representing approximately 90 percent of total employment in industries covered by survey. For meaning of abbreviations and symbols, see introductory text]

Type of machinery	June 30, 1983	June 30, 1978	Type of machinery	June 30, 1983	June 30, 1978
Woolen and worsted spindles	756 807	936 824	Doubling and twisting spindles	130 453	(NA)
For carpet	193 189	222 901	Ring spindles	100 159	(NA)
Woolen system spindles	(D)	(D)	4 inches or less	33 275	(NA)
Worsted system spindles	77 504	96 932	More than 4 inches	66 884	(NA)
American (modified) system spindles	87 936	74 328			
Other spinning system spindles	(D)	(D)	Two-for-one twisting spindles	30 294	(NA)
For weaving, including craft	342 707	395 568			
Woolen system spindles	117 993	167 589	Throwing spindles	23 742	(NA)
Worsted system spindles	182 928	156 983			
American (modified) system spindles	39 580	24 699	Winders and spoolers	37 562	(NA)
Midfiber system spindles	(D)	14 297	Automatic	18 365	(NA)
Other spinning system spindles	(D)		Manual	19 197	(NA)
For knitting, including craft and hand knitting	(D)	329 464	Woolen and worsted cards	1 371	1 736
Woolen system spindles	54 484	30 992	60 inches or less	886	1 233
Worsted system spindles	128 704	233 074	More than 60 inches	485	503
American (modified) system spindles	34 619	53 298			
Midfiber system spindles	(D)	12 130	Worsted combs	382	619
Other spinning system spindles	(D)				
For other uses	(D)	20 891	Machines for converting manmade fiber tow to top or sliver	370	690

Table 5. Woolen and Worsted System Spindles, Including Midfiber, By Type and Geographic Area: June 30, 1983 and June 30, 1978

[Data are aggregates of reported data from companies representing approximately 90 percent of total employment in industries covered by survey. For meaning of abbreviations and symbols, see introductory text]

Geographic area	June 30, 1983			June 30, 1978		
	Woolen system	Worsted system	American (modified) system	Woolen system	Worsted system	American (modified) system
United States	(D)	399 136	162 136	(D)	486 899	162 295
Alabama	-	(D)	(D)	(D)	9 896	(D)
Georgia	(D)	49 804	86 744	35 982	61 456	49 576
Maine	33 002	(D)	(D)	36 170	9 096	(D)
Massachusetts	17 652	(D)	(D)	31 418	(D)	(D)
New Hampshire	14 784	22 856	-	15 080	(D)	-
New York	9 720	(D)	(D)	10 730	(D)	-
North Carolina	32 271	197 812	49 480	43 480	281 132	21 096
Pennsylvania	7 078	(D)	(D)	9 632	(D)	5 344
Rhode Island	(D)	22 856	-	(D)	-	(D)
South Carolina	(D)	73 612	10 824	4 944	101 766	29 980
Tennessee	7 326	-	-	9 400	-	-

Note: Detail may not add to total due to region, division, and State statistics which have been withheld to avoid disclosing data for individual companies.

Table 6. Machinery in Place for Filament Yarn Preparation: June 30, 1983 and June 30, 1978

[Excludes carpet yarn preparation machinery. Data are aggregates of reported data from companies representing approximately 90 percent of total employment in industries covered by survey. For meaning of abbreviations and symbols, see introductory text]

Type of machinery		June 30, 1983	June 30, 1978
TEXTURED YARN MACHINERY			
False twist:			
Single heater	spindles	177 790	197 433
Pin spindle	do.	80 812	146 230
Friction spindle	do.	78 354	51 203
Belt spindle	do.	38 624	(NA)
Double heater	do.	150 543	280 890
Pin spindle	do.	60 046	183 004
Friction spindle	do.	83 126	97 886
Belt spindle	do.	7 371	(NA)
Air jet	producing positions	44 519	61 407
Free standing, nonintegrated units	do.	6 858	12 663
Integrated with other texturing machines	do.	37 661	48 744
Two-for-one twisting spindles	do.	13 400	(NA)
Stuffer box	do.	855	2 606
Knit-deknit	do.	1 712	6 029
Edge crimping	do.	(D)	(D)
Gear crimping	do.	(D)	2 686
Precision winders	do.	23 310	(NA)
FLAT FILAMENT YARN PREPARATION MACHINERY			
Two-for-one twisting spindles	do.	31 606	(NA)
Direct cable twisters	do.	4 482	(NA)

Table 7. Warp Preparation Equipment in Place: June 30, 1983 and June 30, 1978

[Data are aggregates of reported data from companies representing approximately 90 percent of total employment in industries covered by survey. For meaning of abbreviations and symbols, see introductory text]

Type of equipment	June 30, 1983	June 30, 1978
Warping and beaming equipment	2 782	2 791
Spindle driven	1 098	1 029
Drum driven	1 684	1 755
Slashing and sizing equipment	872	1 003
Drawing-in machines	324	356

Table 8. Broad Fabric Weaving Looms in Place by Type and Width of Loom: June 30, 1983

[Data are aggregates of reported data from companies representing approximately 80 percent of total employment in industries covered by survey. For meaning of abbreviations and symbols, see introductory text]

Width of loom[1]	Shuttle type weaving looms				
	Total	Single shuttle (cam and dobby)	Multiple shuttle-box or head motion looms	Jacquard	Double shuttle pile and plush
Shuttle type looms	147 382	129 460	11 387	4 535	2 040
40 inches or less	12 991	10 838	887		
41 to 50 inches	68 848	55 639	2 257	1 994	748
51 to 60 inches	27 113	21 036	4 676	831	788
61 to 70 inches	24 839	23 225	777	851	236
71 to 80 inches	3 806	2 287	940	529	51
81 to 90 inches	11 178	10 520	389		
91 to 100 inches	9 534	2 582	887		
101 to 130 inches	(D)	2 383	473	(D)	(D)
131 inches or more		786	271		

Width of loom[1]	Shuttleless type weaving looms				
			Multifilling insertion		
	Total	Single filling insertion	2 colors	More than 2 colors	Pile and plush
Shuttleless type looms	83 788	34 830	9 822	11 233	1 833
Water jet	5 420	4 672	(D)	38	(D)
50 inches or less					
51 to 60 inches		(D)			
61 to 70 inches					
71 to 80 inches		1 372			
81 to 90 inches	2 486	2 025	(D)	(D)	(D)
91 to 100 inches					
101 to 130 inches	(D)	(D)	(D)	(D)	(D)
131 inches or more					
Air jet	7 151	(D)	839	(D)	(D)
50 inches or less	1 152	1 152			
51 to 60 inches	2 803	2 236			
61 to 70 inches	2 257	1 788	(D)	(D)	(D)
71 to 80 inches	(D)	(D)			
81 to 90 inches					
91 to 100 inches	474	355			
101 to 130 inches	(D)	(D)	(D)	(D)	(D)
131 inches or more					
Rapier	22 802	12 462	2 236	6 986	1 136
50 inches or less	2 959	2 845			
51 to 60 inches	5 873	3 783	628	954	479
61 to 70 inches	5 204	2 942	483	1 614	155
71 to 80 inches	4 396	899	882	2 831	84
81 to 90 inches	2 948	1 720	67	1 081	-
91 to 100 inches				413	
101 to 130 inches	396	(D)	77	107	(D)
131 inches or more					
Projectile	17 427	(D)	2 457	3 484	(D)
50 inches or less	412			284	
61 to 100 inches		360		1 852	
101 to 130 inches	(D)	8 277	1 082	534	(D)
131 inches or more		4 098	1 336	794	
Other	996	67	(D)	(D)	(D)
50 inches or less					
51 to 60 inches				(D)	
61 to 70 inches		(D)			
71 to 80 inches				(D)	
81 to 90 inches					
91 to 100 inches					
101 to 130 inches	(D)	(D)	(D)	(D)	(D)
131 inches or more					

Note: Data for broad fabric weaving looms in place are collected on a quarterly basis and published in Current Industrial Reports, series MQ-22T, Broadwoven Fabrics (Gray).

[1]Maximum width that can be woven (width at take-off point), not finished width of fabric.

Table 9. Broad Fabric Weaving Looms in Place by Type and Width of Loom: June 30, 1978

[Data are aggregates of reported data from companies representing approximately 90 percent of total employment in industries covered by survey. For meaning of abbreviations and symbols, see introductory text]

Width of loom[1]	Shuttle type weaving looms				
	Total	Single shuttle (cam and dobby)	Multiple shuttle-box or head motion looms	Jacquard	Double shuttle pile and plush
Shuttle type looms	381 994	328 579	16 783	6 722	4 589
40 inches or less	15 813	12 321	1 181	1 275	836
41 to 50 inches	121 580	117 117	2 258	845	1 370
51 to 60 inches	53 900	44 275	6 586	1 760	1 277
61 to 70 inches	31 883	28 804	1 183	670	586
71 to 80 inches	8 673	6 723	1 074	741	135
81 to 90 inches	19 256	16 997	1 786	[illegible]	[illegible]
91 to 100 inches	4 456	2 978	978		
101 to 130 inches	4 954	3 550	1 142		
131 inches or more	1 800	1 018	583		

Width of loom[1]	Shuttleless type weaving looms			
	Total	Single filling insertion	Multifilling insertion	Pile and plush
Shuttleless type looms	94 217	22 711	16 319	1 186
Jet, including water and air	6 109	5 834	272	00
Less than 50 inches	509	509	[illegible]	
50 to 63 inches	3 083	[illegible]		
64 inches or more	2 504			
Other, including rapier and projectile	28 111	16 877	10 036	1 198
50 inches or less	2 780	2 469		
51 to 60 inches	4 536	3 020	1 672	
61 to 70 inches	3 856	2 754	974	
71 to 80 inches	3 033	[illegible]	2 322	
81 to 90 inches	5 591		3 395	
91 to 100 inches	64			
101 to 130 inches	5 450	4 089	[illegible]	
131 inches or more	2 469	1 858	891	

Note: Data for broad fabric weaving looms in place are collected on a quarterly basis and published in Current Industrial Reports, series MQ-22T, Broadwoven Fabrics (Gray).

[1]Maximum width that can be woven (width at take-off point), not finished width of fabric.

Table 10. Broad Fabric Weaving Looms by Geographic Area: June 30, 1983

[Data are aggregates of reported data from companies representing approximately 90 percent of total employment in industries covered by survey. For meaning of abbreviations and symbols, see introductory text]

Geographic area	Shuttle type weaving looms					Shuttleless type weaving looms					
	Total	Single shuttle (cam and dobby)	Multiple shuttle-box or head motion looms	Jacquard	Double shuttle pile and plush	Total	Water jet	Air jet	Rapier	Projectile	Other
United States	147 392	129 480	11 387	4 536	2 949	63 799	6 438	7 151	22 603	17 427	996
Alabama	9 843	8 989	[illegible]	(D)	(D)	2 469	[illegible]	(D)	1 217	1 229	[illegible]
California	(D)	(D)									
Georgia	19 364	17 416		321	(D)	6 212		(D)		3 434	
Maine	1 188	[illegible]		(D)	-	[illegible]		-		[illegible]	
Massachusetts	2 093	1 804		229	-	849		-			
New Hampshire	[illegible]	-		[illegible]	[illegible]	[illegible]		-			
New Jersey	891	[illegible]									
New York	1 939	1 708									
North Carolina	84 808	19 407									
Pennsylvania	2 871	1 708									
Rhode Island	582	(D)				[illegible]					
South Carolina	66 331	63 317									
Tennessee	3 943	(D)									

Note: Detail may not add to total due to region, division, and State statistics which have been withheld to avoid disclosing data for individual companies.

Table 11. Broad Fabric Weaving Looms by Geographic Area: June 30, 1978

[Data are aggregates of reported data from companies representing approximately 90 percent of total employment in industries covered by survey. For meaning of abbreviations and symbols, see introductory text]

Geographic area	Shuttle type weaving looms					Shuttleless type weaving looms		
	Total	Single shuttle (loom and dobby)	Multiple shuttle-box or head motion looms	Jacquard	Double shuttle pile and plush	Total	Jet, including water and air	Other, including rapier and projectile
United States	251 904	229 679	16 755	5 722	4 580	94 217	6 169	36 111
Alabama	19 199	4 114						
California								
Georgia	33 923	31 232	1					
Maine		671						
Massachusetts	3 726	3 176						
New Hampshire								
New Jersey								
New York	1 105							
North Carolina								
Pennsylvania								
Rhode Island								
South Carolina								
Tennessee	(D)	17 897						

Note: Detail may not add to total due to region, division, and State statistics which have been withheld to avoid disclosing data for individual companies.

Table 12. Broad Fabric Weaving Looms by Type of Looms and Type of Mill: June 30, 1983 and June 30, 1978

[Data are aggregates of reported data from companies representing approximately 90 percent of total employment in industries covered by survey. For meaning of abbreviations and symbols, see introductory text]

Type of loom	June 30, 1983					June 30, 1978				
	Weaving mills, cotton (SIC 2211)	Weaving mills, manmade fiber and silk (SIC 2221)	Weaving and finishing mills, wool (SIC 2231)	Tire cord and fabric (SIC 2296)	All other mills	Weaving mills, cotton (SIC 2211)	Weaving mills, manmade fiber and silk (SIC 2221)	Weaving and finishing mills, wool (SIC 2231)	Tire cord and fabric (SIC 2296)	All other mills
Broad fabric weaving looms	88 547	121 889	2 883	1 883	7 165	101 698	102 741	2 384	2 696	7 444
Shuttle	83 193	87 583	1 049	1 082	4 506	92 263	189 836	1 579		
Single shuttle	47 008	78 117	136	1 082	3 190	83 042	143 951	210	2 378	4 297
Multiple shuttle	3 732	6 230	801	-	474	4 280	10 753	1 355	-	385
Jacquard	1 897	1 885		-		3 710	2 257			
Double shuttle	518	1 351		-		1 251	2 805			
Shuttleless	15 354	34 310	1 474	-	2 659	9 779	22 875	855	(D)	(D)
Water jet	(D)	4 385	-	-		7 841	18 089	855	(D)	(D)
Air jet	2 025	4 393	-	-	725					
Rapier	7 910	13 561	809	-	821					
Projectile	4 915	11 948	665	-	189	932	4 778	-	-	396
Other	(D)	823	-	-	(D)					

Table 13. Narrow Fabric Weaving by Type of Loom: June 30, 1983 and June 30, 1978

[Data are aggregates of reported data from companies representing approximately 90 percent of total employment in industries covered by survey. For meaning of abbreviations and symbols, see introductory text]

Type of loom	June 30, 1983			June 30, 1978		
	Total	Shuttle type	Shuttleless type	Total	Shuttle type	Shuttleless type
Narrow fabric weaving looms	9 299	2 622	6 686	6 800	3 891	4 889
Tape looms	5 709	1 488	4 241	5 785	2 777	3 008
Webbing looms	3 579	1 154	2 425	3 015	1 024	1 991
Lightweight and/or medium weight	2 842	743	2 099	2 531	737	1 794
Heavyweight	549	(D)	(D)	328	(D)	(D)
Extra weight	188	(D)	(D)	156	(D)	(D)

Note: Data for narrow fabric looms in place are collected on an annual basis and published in Current Industrial Reports, series MA-22G, Narrow Fabrics.

Table 14. Knitting Machinery in Place: June 30, 1983 and June 30, 1978

[Data are aggregates of reported data from companies representing approximately 90 percent of total employment in industries covered by survey. For meaning of abbreviations and symbols, see introductory text]

Type of machinery	June 30, 1983	June 30, 1978
Warp knitting machines:		
Tricot	2 886	4 431
Compound needle	1 008	(NA)
Spring beard	1 877	(NA)
Compound raschel	859	2 248
Latch raschel	2 142	
Raschel-crochet	379	357
Weft insertion machines	148	619
All other, including Kettan raschel, simplex, milanese, and loop vending	255	
Weft knitting machines:		
Garments, trims and collars:		
Flat bar	4 918	8 232
V-bed flat latch needle	3 612	4 333
Flat-bed purl, or links and links	895	1 104
Multisection spring needle full fashioning	421	796
Cylinder and dial	2 109	3 280
Circular lengths	2 606	2 701
Rib	2 219	1 825
Interlock	368	776
Circular headwear and other small diameter machines, excluding hosiery and knit-deknit	1 009	1 516
Yard goods, outerwear, underwear, and industrial:		
Circular open top latch needle machines:		
Plain:		
64 feed or less	4 414	5 943
65 to 96 feed	662	731
More than 96 feed	396	100
Multiple track	1 289	
Fleece	707	
Two-end	527	
12 to 17 cut	129	
10 to 30 inch cylinder	[illegible]	
More than 30 inch cylinder	[illegible]	
18 cut and finer	398	
10 to 30 inch cylinder	[illegible]	
More than 30 inch cylinder	[illegible]	
Three-end	180	1 374
12 to 17 cut	130	
10 to 30 inch cylinder	[illegible]	
More than 30 inch cylinder	[illegible]	
18 cut and finer	50	
10 to 30 inch cylinder	50	
More than 30 inch cylinder	-	
Other	882	
64 feed or less	277	
65 to 96 feed	226	
More than 96 feed	78	

Type of machinery	June 30, 1983	June 30, 1978
Weft knitting machines—Con.		
Yard goods, outerwear, underwear, and industrial—Con.		
Circular open top latch needle machines—Con.		
Patterned jersey:		
64 feed or less	1 899	2 012
65 to 96 feed	119	140
More than 96 feed	83	86
Silver knit	617	512
Circular spring needle machines:		
Fleece	4 123	2 423
6 to 8 cut	462	
10 to 30 inch cylinder	372	
More than 30 inch cylinder	90	
9 to 14 cut	2 879	
10 to 30 inch cylinder	2 681	
More than 30 inch cylinder	215	
15 cut and finer	785	
10 to 30 inch cylinder	716	
More than 30 inch cylinder	69	
Other	873	
Cylinder and dial machines:		
Interlock	2 336	3 682
By cut:		
18 or less	1 082	1 826
22 to 24	829	1 255
28 or more	425	601
By feed:		
64 feed or less	1 885	3 161
65 to 96 feed	280	482
More than 96 feed	181	40
Rib body size underwear machines	3 278	4 292
Double knit, including eight lock	3 377	5 286
By type:		
No pattern mechanism	850	1 870
Fixed selection, including patterns limited to one machine revolution	355	2 148
Patterning device, mechanical and electronic (more than one machine revolution)	2 372	4 250
By cut:		
18 or less	1 991	5 084
22 to 24	1 172	2 499
28 or more	214	703
By feed:		
64 feed or less	3 051	7 480
65 to 96 feed	326	798
More than 96 feed	-	80
Purl or links and links	402	891

Table 15. Textile Finishing Machinery in Place: June 30, 1983 and June 30, 1978

[Data are aggregates of reported data from companies representing approximately 90 percent of total employment in industries covered by survey. For meaning of abbreviations and symbols, see introductory text]

Type of machinery	June 30, 1983	June 30, 1978
Scouring and bleaching ranges	670	899
Rope	219	348
Open width	261	305
Other	190	246
Mercerizing ranges	89	89
Dyeing machinery:		
Raw stock and bale dyeing machines[1]	231	344
Yarn dyeing machines	2 471	2 413
Package yarn[1]	1 283	1 070
Beam	395	582
Continuous	92	102
Skein	623	520
Other	88	139
Batch fabric dyeing machines	5 789	5 629
Jigs	1 080	1 128
Padders	263	322
Becks (boxes, winches, dye kettles, etc.):		
Atmospheric type	1 982	2 240
Pressure type	499	314
Jet	1 349	1 079
Beam	445	359
Other	171	187
Carpet dyeing machines	568	885
Beck	528	855
Continuous	40	30
Garment dyeing machines	1 036	1 123
Rotary	479	562
Paddle	557	561
Continuous dyeing ranges	288	284
Thermosol-pad-steam	144	115
Other continuous	144	149
Printing machinery:		
Roller printing machines	209	259
Less than 70 inches	185	239
70 inches or more	24	20
Printing machinery—Con.		
Screen printing machines	464	364
Flat screen, flat bed machines	163	153
For carpet	48	13
For other than carpet	115	140
Rotary screen, flat bed machines	169	167
Less than 60 inches	28	25
60 to 89 inches	123	88
90 to 119 inches	33	27
120 inches or more	11	17
Other screen printing machines	88	84
Continuous piece goods heat transfer printing machines	80	43
Other printing equipment	178	71
Compressive shrinkage machines	278	386
For woven fabrics	223	264
For knit fabrics	55	122
Tenter frames	1 318	1 391
Clip	618	654
Pin	658	693
Pin-clip combination	42	44
Solvent processing units (batch and continuous)	79	117
Decating	159	156
Fulling mills	244	228
Surface finishing machinery	2 525	2 633
Napping	885	867
Shearing	631	540
Brushing, sueding, and sanding	259	411
Embossing	86	89
Calendaring	664	726
Corduroy and velveteen cutting machines	336	451

[1]Number of kairs or kettles.

Table 16. Textile Finishing Machinery by Type of Mill: June 30, 1983

[Data are aggregates of reported data from companies representing approximately 90 percent of total employment in industries covered by survey. For meaning of abbreviations and symbols, see introductory text]

Type of machinery	Total number in place	Number of machines primarily processing— Weaving mills, cotton (SIC 2211)	Weaving mills, manmade fiber and silk (SIC 2221)	Knitting mills (SIC 225)	Other industries
Scouring and bleaching ranges	670	105	188	173	203
Rope	219	32	40	64	83
Open width	281	39	118	44	59
Other	180	34	30	65	67
Mercerizing ranges	69	(D)	(D)	-	66
Dyeing machinery:					
Raw stock and bale dyeing machines	231	21	48	-	162
Yarn dyeing machines	2 471	342	374	190	1 565
Package yarn[1]	1 283	89	184	117	893
Beam	395	207	137	-	51
Continuous	82	(D)	(D)	(D)	39
Skein	623	(D)	23	40	549
Other	96	(D)	(D)	(D)	83
Batch fabric dyeing machines	5 969	884	1 638	2 022	1 425
Jigs	1 080	223	650	47	160
Padders	283	(D)	(D)	82	62
Becks (boxes, winches, dye kettles, etc.):					
Atmospheric type	1 862	83	236	796	747
Pressure type	489	240	93	87	79
Jet	1 349	40	383	721	216
Beam	445	43	193	134	75
Other	171	(D)	(D)	85	66
Carpet dyeing machines	569	(D)	-	(D)	542
Beck	528	(D)	-	(D)	505
Continuous	40	(D)	-	(D)	37
Garment dyeing machines	1 036	(D)	(D)	974	53
Rotary	479	(D)	(D)	454	16
Paddle	557	-	-	520	37
Continuous dyeing ranges	288	50	82	22	134
Thermosol-pad-steam	144	28	56	6	54
Other continuous	144	22	26	16	80
Printing machinery:					
Roller printing machines	209	(D)	72	(D)	40
Less than 70 inches	185	58	62	37	28
70 inches or more	24	(D)	10	(D)	12
Screen printing machines	454	100	177	57	120
Flat screen, flat bed machines	163	24	61	20	58
For carpet	48	-	(D)	(D)	13
For other than carpet	115	24	(D)	(D)	45
Rotary screen, flat bed machines	193	38	92	21	42
Less than 60 inches	28	(D)	17	(D)	(D)
60 to 89 inches	123	26	61	17	19
90 to 119 inches	33	7	(D)	(D)	13
120 inches or more	11	(D)	(D)	-	(D)
Other screen printing machines	98	38	24	16	20
Continuous piece goods heat transfer printing machines	60	9	17	11	23
Other printing machinery	176	70	39	37	30
Compressive shrinkage machines	278	44	(D)	(D)	125
For woven fabrics	223	44	(D)	(D)	(D)
For knit fabrics	55	-	(D)	(D)	(D)
Tenter frames	1 318	177	435	220	486
Clip	618	(D)	302	(D)	152
Pin	658	28	119	195	316
Pin-clip combination	42	(D)	14	(D)	18
Solvent processing units (batch and continuous)	79	8	9	12	50
Decating	159	7	33	36	83
Fulling mills	244	(D)	(D)	(D)	212
Surface finishing machinery	2 525	301	404	680	1 140
Napping	885	135	67	228	455
Shearing	631	28	43	209	351
Brushing, sueding, and sanding	259	24	32	(D)	(D)
Embossing	86	16	45	(D)	(D)
Calendaring	664	98	217	242	107
Corduroy and velveteen cutting machines	330	326	-	(D)	(D)

[1]Number of keirs or kettles.

Table 17. Textile Finishing Machinery by Type of Mill: June 30, 1978

[Data are aggregates of reported data from companies representing approximately 90 percent of total employment in industries covered by survey. For meaning of abbreviations and symbols, see introductory text]

Type of machinery	Total number in place	Number of machines primarily processing— Weaving mills, cotton (SIC 2211)	Weaving mills, manmade fiber and silk (SIC 2221)	Knitting mills (SIC 225)	Other industries
Scouring and bleaching ranges	899	203	320	214	162
Rope	340	76	74	82	108
Open width	305	63	161	68	23
Other	246	64	86	64	33
Mercerizing ranges	68	27	35	(D)	(D)
Dyeing machinery:					
Raw stock and bale dyeing machines	344	40	57	44	223
Yarn dyeing machines	2 413	465	601	130	1 217
Package yarn	1 080	183	163	93	641
Beam	582	211	304	(D)	(D)
Continuous	102	40	(D)	(D)	56
Skein	620	(D)	95	(D)	463
Other	139	(D)	(D)	30	(D)
Batch fabric dyeing machines	5 629	514	2 250	2 281	584
Jigs	1 129	236	731	101	58
Padders	322	68	104	125	25
Becks (boxes, winches, dye kettles, etc.):					
Atmospheric type	2 240	143	694	1 114	289
Pressure type	314	7	154	109	44
Jet	1 079	34	419	586	41
Beam	359	(D)	126	180	(D)
Other	187	(D)	39	89	(D)
Carpet dyeing machines	686	-	(D)	(D)	657
Beck	656	-	(D)	(D)	627
Continuous	30	-	-	-	30
Garment dyeing machines	1 123	(D)	(D)	1 064	38
Rotary	562	-	(D)	542	(D)
Paddle	561	(D)	(D)	512	(D)
Continuous dyeing ranges	264	76	123	11	54
Thermosol-pad-steam	115	35	56	(D)	(D)
Other continuous	149	41	67	(D)	(D)
Printing machinery:					
Roller printing machines	259	(D)	109	(D)	23
Less than 70 inches	239	(D)	92	(D)	17
70 inches or more	20	(D)	11	(D)	6
Screen printing machines	354	(D)	142	48	(D)
Flat screen, flat bed machines	153	36	64	18	45
For carpet	13	-	-	-	13
For other than carpet	140	36	64	18	32
Rotary screen, flat bed machines	167	64	72	23	8
Less than 60 inches	25	13	8	(D)	(D)
60 to 89 inches	96	36	41	19	-
90 to 119 inches	27	(D)	17	(D)	-
120 inches or more	17	(D)	6	(D)	(D)
Other screen printing machines	34	(D)	16	8	(D)
Continuous piece goods heat transfer printing machines	43	(D)	10	21	(D)
Other printing machinery	71	6	19	25	21
Compressive shrinkage machines	386	120	115	107	44
For woven fabrics	264	(D)	106	7	(D)
For knit fabrics	122	(D)	9	100	(D)
Tenter frames	1 391	290	624	285	192
Clip	654	247	351	33	23
Pin	693	29	257	238	169
Pin-clip combination	44	14	16	14	-
Solvent processing units (batch and continuous)	117	14	19	54	30
Decating	156	(D)	43	52	(D)
Fulling mills	229	-	29	41	161
Surface finishing machinery	2 833	484	876	843	630
Napping	867	225	185	286	171
Shearing	540	51	158	146	185
Brushing, sueding, and sanding	411	81	77	89	174
Embossing	89	28	41	13	9
Calendering	786	121	215	389	61
Corduroy and velveteen cutting machines	451	362	78	(D)	(D)

Table 18. Other Fabric Forming Machinery in Place: June 30, 1983 and June 30, 1978

[Data are aggregates of reported data from companies representing approximately 90 percent of total employment in industries covered by survey. For meaning of abbreviations and symbols, see introductory text]

Type of machinery	June 30, 1983	June 30, 1978
Fine gauge tufting (non-carpet end uses)	76	70
Nonwoven fabric forming machinery:		
Needle looms	600	794
Web forming	344	241
Stitch bonding	121	(D)
Other	518	342

Table 19. Circular Hosiery Machinery in Place: June 30, 1983 and June 30, 1978

[Data are aggregates of reported data from companies representing approximately 90 percent of total employment in industries covered by survey. For meaning of abbreviations and symbols, see introductory text]

Type of machinery	June 30, 1983	June 30, 1978
Ladies' hosiery machines	30 156	22 905
1 feed	1 587	886
2 feed	4 607	6 983
3 and 4 feed	12 336	11 340
6 to 8 feed	1 618	3 817
Men's and boys' sock machines	33 092	26 075
Single cylinder	24 325	18 171
1 feed	20 509	16 079
2 feed	2 416	1 562
3 and 4 feed	1 400	531
Double cylinder	8 767	7 904
1 feed	281	413
2 feed	7 962	6 972
3 and 4 feed	524	519
Women's, misses', children's, and infants' sock machines	13 694	9 483
Single cylinder	11 697	6 109
1 feed	8 794	5 209
2 feed	2 480	579
3 and 4 feed	423	321
Double cylinder	1 997	3 354

Table 20. Circular Hosiery Machinery in Place by Type of Machine and Geographic Area: June 30, 1983 and June 30, 1978

[Data are aggregates of reported data from companies representing approximately 90 percent of total employment in industries covered by survey. For meaning of abbreviations and symbols, see introductory text]

Geographic area	Total		Ladies' hosiery machines		Men's and boys' sock machines		Women's, misses', children's, and infants' sock machines	
	June 30, 1983	June 30, 1978	June 30, 1983	June 30, 1978	June 30, 1983	June 30, 1978	June 30, 1983	June 30, 1978
United States	66 944	58 443	30 156	22 905	33 092	26 075	13 694	9 483
Alabama	3 882	6 837	(D)	1 784	2 428	2 515	(D)	2 628
Connecticut	-	75	-	(D)	-	(D)	-	-
Massachusetts	-	195	-	-	-	(D)	-	(D)
North Carolina	44 251	35 982	13 177	13 282	21 888	16 717	9 186	5 983
Pennsylvania	3 384	1 896	(D)	40	1 815	1 556	(D)	-
South Carolina	1 648	3 140	(D)	(D)	(D)	(D)	(D)	(D)
Tennessee	5 923	1 670	982	-	2 206	1 407	2 763	283
Virginia	1 246	1 836	(D)	1 019	(D)	(D)	-	(D)

Note: Detail may not add to total due to region, division, and State statistics which have been withheld to avoid disclosing data for individual companies.

Table 21. Carpet and Rug Weaving Looms and Machinery in Place: June 30, 1983 and June 30, 1978

[Data are aggregates of reported data from companies representing approximately 90 percent of total employment in industries covered by survey. For meaning of abbreviations and symbols, see introductory text]

Type of machinery	June 30, 1983	June 30, 1978
Weaving looms[1]	830	719
27 inches	89	64
3 feet to less than 9 feet	204	283
9 feet	35	61
9 1/2 feet to 12 feet	393	250
15 feet or more	109	61
Tufting machines[1]	1 943	2 452
81 inches or less	395	463
9 feet	73	41
12 feet	775	609
15 feet	642	1 283
More than 15 feet	58	56
Fusion bonding machines[1]	44	37
Less than 12 feet	27	13
12 feet or more	17	24
Custom carpet (multipass) tufting machines	216	381
Carpet braiding machines	648	909
Carpet knitting machines	82	40
Carpet and rug needle punch looms	226	82

[1]Size is maximum width which can be woven, tufted, or bonded, not finished width of carpet or rug.

Table 22. Carpet Yarn Heatsetting Machinery in Place: June 30, 1983 and June 30, 1978

[Data are aggregates of reported data from companies representing approximately 90 percent of total employment in industries covered by survey. For meaning of abbreviations and symbols, see introductory text]

Type of machinery	June 30, 1983	June 30, 1978
Filament carpet yarn:		
Twisting[1]	70 536	96 678
Direct cable	58 956	
Other	11 582	
Heatsetting:		
Autoclaves	63	134
Continuous units	521	63
Spun carpet yarn:		
Twisting[1]	85 640	91 134
Direct cable	7 136	
Other	78 504	
Heatsetting:		
Autoclaves	104	170
Continuous units	508	30

[1]Number of spindles.

There is a growing consensus that the future productivity and competitiveness of American industry depends, to a large extent, upon regaining our former leadership in manufacturing technology. Although many key manufacturing technologies such as robots, flexible manufacturing cells and systems, and other automated processes were all first developed in the United States, in many cases, they have been applied more effectively by our foreign competitors. The aggressive application of these process technologies often have resulted in lower costs and superior quality products, further eroding American industries competitive position. As decision makers, both in Government and industry, become more concerned about how these technologies are being used, there is an increased need for information on the patterns of use and the diffusion of these technologies across major manufacturing industries. The Bureau of the Census is committed to developing a statistical program to meet these data needs.

As a first step, we are planning to conduct a comprehensive survey of "discrete" manufacturers, establishments classified in standard industrial classification major groups 34-38, to collect information on current use and future plans to use key manufacturing technologies. Assuming available funding and form approval by the Office of Management and Budget (OMB), we expect to mail report forms in October or November 1987. Besides providing much needed information on present and future use of these technologies across discrete manufacturing industries, the survey results will establish the sampling frame for conducting much more detailed follow-on surveys focusing on specific technologies.

Given your background and interest in this subject, we are asking you to review carefully the enclosed draft report form. Specifically, we are interested in:

(1) Your comments concerning the need for and the usefulness of the data we would be collecting. We need to know whether our sense of need for these data is correct before we try to obtain funding or gain OMB approval.

(2) The survey content. If the survey results are to be useful and relevant, we must ensure we are focusing on the most important technologies. If you recommend alternative technologies to be considered, please include a brief statement explaining the need for this information.

(3) The definitions. In order to ensure accurate and timely reporting, it is important that the definitions be clear and unambiguous. We welcome any suggestions you have concerning how we can improve the clarity of definitions and instructions.

(4) The planning horizon. If a plant is not using a technology in 1987, we will ask if it plans to begin using the technology within the next 2 years. We welcome your comments concerning whether this is the appropriate planning horizon. If you suggest a different interval, please specify your reasons.

(5) Possible follow-on surveys. If funds are available, we plan to conduct detailed follow-on surveys focusing on specific technologies. We will work closely with Government and industry analysts in designing surveys that will collect information on how the technology is being used, problems encountered during implementation, their effect on plant operations, and other pertinent information. For planning purposes, please identify the three most important technologies you think we should consider for more detailed follow-on surveys.

For your convenience, we have enclosed a comment sheet with your name and address. If you have suggestions concerning this survey, please complete the comment sheet and return it in the enclosed envelope by May 30, 1986. If you have any questions or would like to discuss your ideas, please call Tom Mesenbourg on (301) 763-7800.

Sincerely,

(Signed) Gaylord Worden

GAYLORD WORDEN
Chief, Industry Division
Bureau of the Census

Enclosures

U.S. DEPARTMENT OF C/
BUREAU OF THE CENSUS
FORM

SURVEY OF MANUFACTURING TECHNOLOGY – 1987

MA-3CT

O M B APPROVAL NO 0607-0799 EXPIRES 12-31-88

NOTICE – Response to this inquiry is required by law (title 13, U.S. Code). By the same law, your report to the Census Bureau is confidential. It may be seen only by sworn Census employees and may be used only for statistical purposes. The law also provides that copies retained in your files are immune from legal process.

Please complete this form and RETURN TO

BUREAU OF THE CENSUS
1201 East Tenth Street
Jeffersonville, Indiana 47134

DUE DATE: November 15, 1987

If you cannot file by the due date, a time extension request should be sent to the above address; please include your 11-digit Census File Number (CFN).

Note — *Please read the special instructions on reverse side before answering items 2–8.*

In correspondence pertaining to this report, please refer to this Census File Number (CFN)

MC-3302

Employer Identification (EI) Number

Please correct errors in name, address, and ZIP code. ENTER street and number if not shown.

Item 1A – EMPLOYER IDENTIFICATION NUMBER

Is the Employer Identification (EI) Number shown in the label the SAME as that used for this establishment on its latest 1982 Employer's Quarterly Federal Tax Return, Treasury Form 941?

084 1 [ ] YES 2 [ ] NO Enter current EI Number → (9 digits)

Item 1B – PHYSICAL LOCATION OF ESTABLISHMENT – *Answer parts a, b, c, and d*

NOTE: P.O. boxes or rural routes are not physical locations.

a. [ ] Same as shown in mailing label. If different, indicate actual physical location.

NUMBER AND STREET

CITY, TOWN, VILLAGE, ETC | STATE | ZIP CODE

General Instructions

If you have any of the manufacturing technologies listed below at this plant, mark the box in column one beside that technology. If you plan to use any of these technologies in the next 2 years, mark the appropriate box in column 2. If you have no plans to use these technologies, mark the appropriate box in column 3. Check only one column for each technology.

	TECHNOLOGY	In use now	Plan to use in next 2 years	Not using; no plans to use
DESIGN AND ENGINEERING	Computer Aided Design (CAD)/ Computer Aided Engineering (CAE)	O	O	O
	CAD Output Used to Control Manufacturing Machines (CAD/CAM)	O	O	O
	Digital Data Representation of CAD Output used in Procurement Activities	O	O	O
FABRICA-	Standalone NC/CNC machines	O	O	O
			O	O

	TECHNOLOGY		In use now	Plan to use in next 2 years	Not using; no plans to use
AUTOMATED MATERIAL HANDLING	Automatic Storage and Retrieval Systems (AS/RS)		O	O	O
	Automatic Guided Vehicle Systems (AGVS)		O	O	O
INSPECTION AND TESTING	Computer-based inspection, sensor, and testing equipment.		O	O	O
	INSPECTION PERFORMED	End-of-Line	O	O	O
		In-Line	O	O	O

ASSEMBLY	Flexible Manufacturing Systems (FMS)	O	O	O	COMMUNICATIONS AND CONTROL	AREA NETWORKS	Factory Network	O	O	O
	Laser Based Fabrication Equipment	O	O	O			Intercompany computer network linking plant to suppliers and/or customers	O	O	O
ROBOTS	Simple Pick and Place Robots	O	O	O			Programmable controllers	O	O	O
	Other More Complex Robots	O	O	O			Industrial computers used on factory floor	O	O	O

DEFINITIONS:

COMPUTER-AIDED DESIGN (CAD)/COMPUTER-AIDED ENGINEERING (CAE)—Use of computer for drawing and designing parts or products (CAD) or for analysis and testing of designed parts or products.

COMPUTER-AIDED DESIGN(CAD)/COMPUTER-AIDED MANUFACTURING (CAM)—Mark this box if you use or plan to use CAD output to control the machines used to manufacture the part or product (CAM).

DIGITAL DATA REPRESENTATION—Mark this box if your plant uses the digital data representation of the CAD output in procurement actions.

STANDALONE NC/CNC MACHINE—A single machine either numerically controlled (NC) or computer numerically controlled (CNC) with or without automated material handling capabilities. NC machines are controlled by numerical commands, punched on paper or plastic mylar tapes while CNC machines are controlled electronically through a computer residing in the machine.

FLEXIBLE MANUFACTURING CELLS (FMC)—Three or less machines with fully integrated material handling capabilities controlled by a single computer or programmable controller.

FLEXIBLE MANUFACTURING SYSTEMS (FMS)—Four or more machines with fully integrated material handling capabilities controlled by a computer or a number of computers.

LASER BASED FABRICATION EQUIPMENT—Laser technology used for welding, cutting, scribing, and marking.

ROBOTS—A reprogrammable, multifunctional manipulator designed to move materials, parts, tools, or specialized devices through variable programmed motions for the performance of a variety of tasks.

PICK AND PLACE ROBOTS—A simple robot, with one, two, or three degrees of freedom, which transfers items from place to place by means of point to point moves. Little or no trajectory control is available.

AUTOMATIC STORAGE AND RETRIEVAL SYSTEMS (AS/RS)—Computer controlled equipment providing for the automatic handling and storage of materials, parts, subassemblies, or finished products.

AUTOMATIC GUIDED VEHICLE SYSTEMS (AGVS)—Vehicles equipped with automatic guidance devices programmed to follow a path that interfaces with work stations for automated or manual loading and unloading of materials, tools, parts, or products.

INSPECTION AND TESTING—Mark this box if you use or plan to use any computer based inspection, testing, or sensing equipment, including vision systems. For inspection applications, mark the box which indicates whether the inspection occurs at the end of the production process (end-of-line inspection) or at various stages during the production process (in-line inspection).

COMMUNICATIONS AND CONTROL—If your plant is using or planning to use a Local Area Network (LAN) technology, mark the box which indicates whether the LAN is used primarily for general office use or on the factory floor. If your plant is using or planning to use a computer network linked to your supplier and/or customers, please mark the appropriate box.

PROGRAMMABLE CONTROLLER (PC)—A solid state industrial control system which has programmable memory for storage of instructions. Performs functions equivalent to a relay panel or wired solid state logic control system.

If your plant is using or planning to use industrial computers on the floor, please mark the appropriate box.

Item 22 – CERTIFICATION – This report is substantially accurate and has been prepared in accordance with instructions.

Name of person to contact regarding this report *Print or type*	Telephone			Address – *Number and street*		
	Area code	Number	Extension	City	State	ZIP code

PENALTY FOR FAILURE TO REPORT

Follow-on Surveys: If funds become available, identify the three most important manufacturing technologies we should consider for detailed follow-on surveys:

1. _____

_____

2. _____

_____

3. _____

_____

Other persons we should contact regarding this survey. Please provide name, organization, address, and telephone numbers:

Name: _____ Name: _____

Address: _____ Address: _____

_____ _____

_____ _____

_____ _____

Telephone: _____ Telephone: _____

Name: _____ Name: _____

Address: _____ Address: _____

_____ _____

_____ _____

_____ _____

Telephone: _____ Telephone: _____

Below are comments and suggestions for consideration during the design of the final 1987 Survey of Manufacturing Technology form:

Need for Information on Manufacturing Technology:

Survey Content:

Definitions:

Two Year Planning Horizon Appropriate? (Check box) Yes ☐ No ☐

If "NO," specify preferred planning horizon and why:

Other comments: