# 1 Background

The surgical instruments manufacturing cluster is located in the city of Sialkot. Sialkot has long been known for the expertise of its people in making metal related products. The blacksmiths of the region produced swords and daggers for the Mughal Emperors. The highly skilled metalworking of the ironsmiths has also been mentioned in the various colonial gazettes. The surgical instruments manufacturing actually started in this region at the turn of the century. The American Mission hospital of Sialkot generated some demand of surgical instruments by getting its scalpels and other instruments repaired from the local artisan community of the blacksmiths, these craftsmen successfully replicated some of the instruments which were used by the hospital.

By the end of the second decade of the twentieth century there were about twenty manufacturing concerns, involved in the manufacturing of swords, spearheads, knives, razors, etc and couple of units were reported to make good quality surgical instruments. By the 1930s surgical industry started exporting instruments to Egypt and Afghanistan. The Second World War played a vital role in the development of surgical goods industry, the surgical instruments manufacturer supplied surgical instruments not only to meet the demand of Indian but also the Allied forces. The British Government, in order to facilitate the local industry technology, also established the Metal Industries development Center (MIDC) in 1941. It is through this path, the industry has evolved from basic metal products manufacturing into precision surgical instruments manufacturing.

At the time of partition there were a total of 17 registered surgical instruments manufacturers in Sialkot with US $ 368,000 worth of exports. The 1960s marked the export growth of surgical sector through various fiscal and credit incentives of the Government which also lead to the wide scale technological up-gradation of the industry. The labour legislation of 1973 led to wide spread displacement of the labour force particularly in the surgical sector. This phenomenon of increased labour costs influenced the trend of subcontracting of processes to specialised vendors. The vendorization in the

industry lowered the manufacturing costs and other overheads and it was during this period that the demand for Pakistan's disposable surgical instruments increased in the United States market.

***Chronology of Events***

***Table 1***

| Moments | Periods | Main Features |
|---|---|---|
| 1st | 1890-1910 | Local Mission Hospital generates initial demand. Local producers emerge from a local skill base in metalworking |
| 2nd | 1940-45 | World War II boosts demand as cluster supplies war effort |
| 3rd | 1947 | Partition leads to exodus of Hindu traders and industrialists |
| 4th | 1958 | Surgical Instruments Manufacturers Association (SIMA) is established |
| 5th | Late 1960s | New mechanised technology introduced. Quality and productivity increases |
| 6th | 1973 | Labour laws pushes up wage costs and encourages expansion of putting-out |
| 7th | Early 1980s | Rapid growth in US demand for disposable instruments |
| 8th | 1994 | Food and Drug Administration of USA imposes complete ban on imports of surgical instruments from Pakistan |
| 9th | End 1994 | Government of Pakistan appoints an American company Medical Quality Systems (MQS) to facilitate the implementation of Good Manufacturing Practice (GMP) |

# 2 Global Trade of Surgical Instruments

According to the domestic industry sources surgical instruments are only manufactured in Germany or Pakistan and a few other countries such as Japan, United Kingdom, etc. Among these Germany is considered to be the market leader considering all the attributes such as range of instruments, quality, innovation, etc. The Pakistani surgical instrument manufacturers consider only Germany to be their competitor.

## 2.1 Global Data Reporting

The world trade in surgical instruments is reported under Standard International Trade Classification (SITC) code 872 which is a broad category for medical devices and surgical instruments including Electro-medical equipment. To obtain details and find out the actual share of Pakistan in global exports, the SITC code has to be further analysed at five-digit level. 87229 and 87219 are the two categories representing other medical instruments and dental instruments respectively. The conventional surgical instruments manufactured in Pakistan are reported in the 'other medical instruments' category. The dental instruments exported from Pakistan are being reported in the 'other dental instruments' category. (Seven-digit break-up of the codes is provided in the exhibit 1)

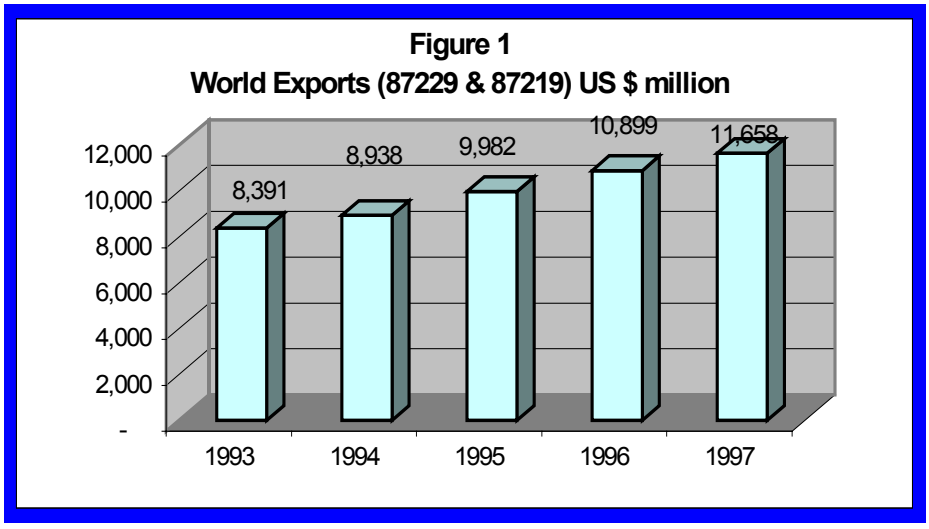
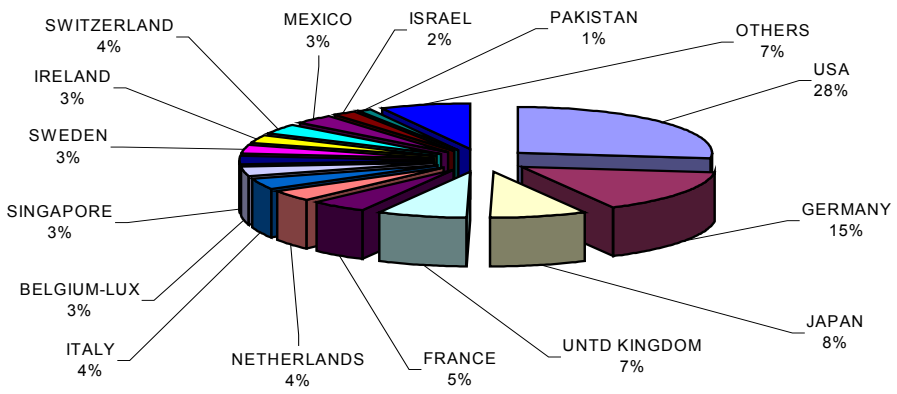


**Figure 2**
**World Export Shares 1997 (SITC 87229 & 87219)**




## 2.2 Global Trade and Shares

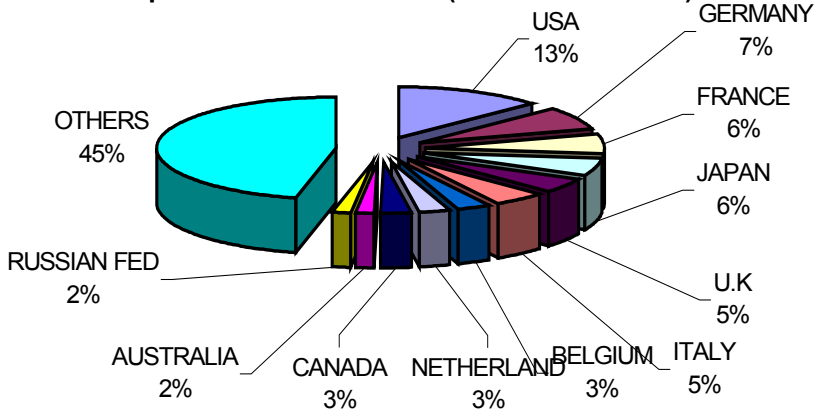
Figure 1 shows during the year 1997 the global exports of the two categories (SITC 87229 & 87219) representing other medical and dental instruments, were US $ 11.6 billion. The average growth of exports, of these two categories, over a period of five years, has been around 9%.

The United States of America is the largest exporter of surgical and dental instruments with 28% share. Germany Japan and United Kingdom each with a share of 15%, 8% and 7% respectively also enjoy major share in the global exports. Pakistan only has a 1% share in the global exports of the two categories, mentioned above.

Figure 3 depicts the world import market shares of surgical and dental instruments. Like the global export trade, the USA is also the largest importer in these categories with 13% market share in the total world imports of surgical and dental instruments which was US $ 10.8 billion during 1997. It is interesting to observe that the countries, which are the major importers of surgical and dental instruments, are also the major shareholders in the global exports of the same category. One of the reasons for this phenomenon could be

that the instruments imported from different countries, such as Pakistan, are being re-exported to other countries of the world.

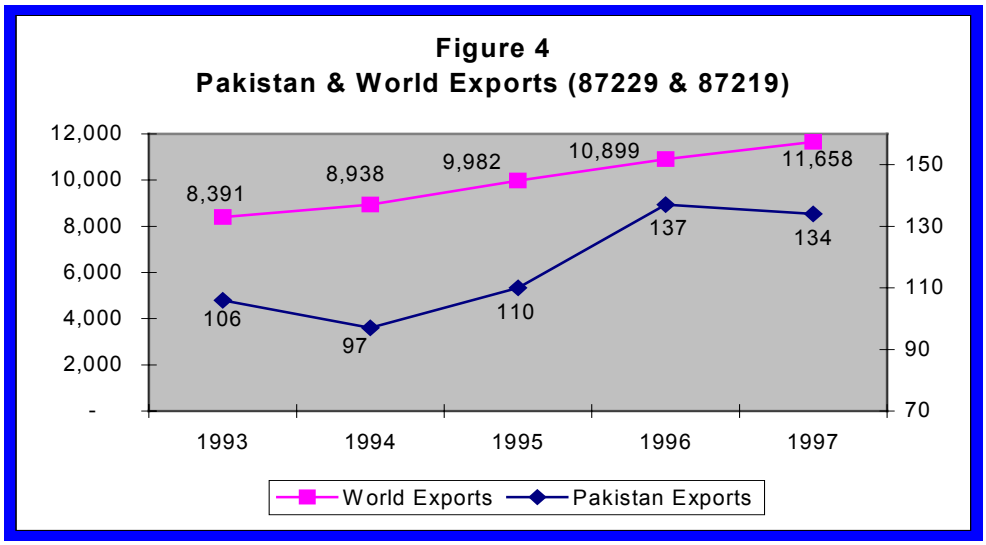
**Figure 3**
**World Import Market Shares 1997 (SITC 87229 & 87219)**




## 3 Pakistan Export of Surgical Instruments

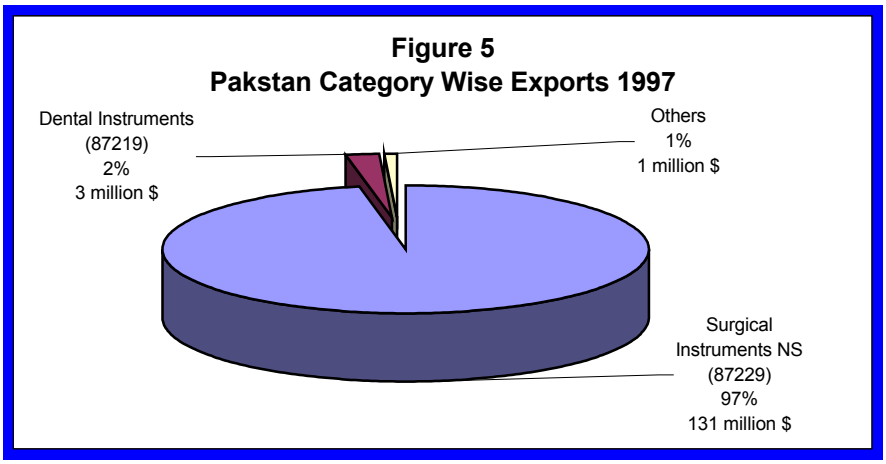
Pakistan started exporting surgical instruments in the late 1940s. At that time Pakistan's export comprised of only a few thousand dollars. Pakistan's total exports during the year 1997-98 were US $ 8.5 billion out of which US $ 134 million worth of surgical instruments were exported. Surgical instruments exports contribute 1.5% to the total export earnings of the country.

The world export market for surgical and dental instruments, observed over a period of five years, has been growing at an average rate of 9% annually. Pakistan's export of surgical instruments, when observed during the same period does not seem to be consistent with the global export growth trends. There can be a number of reasons for this inconsistent performance of the surgical sector, e.g., the industry suffered a major set back when USA imposed a complete ban on the exports of surgical instruments form Pakistan during 1994. The details of the American ban and other reasons of such trends in exports will be discussed in the latter part of the report.




## 3.1 Export Markets

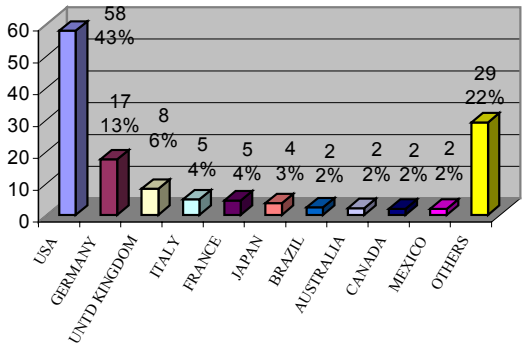
As mentioned earlier that Pakistan surgical exports are dominated by surgical instruments reported under SITC 87229, followed by the dental instrument category reported under SITC 87219. If we take a look at the category wise export-split of total exports of this sector from Pakistan, the share of traditional surgical instruments (such as surgical scissors forceps, scalpel, bone rongers, etc.) comes to around 97%. The dental instruments (such as tooth extraction forceps, impression trays, carvers, etc.) share is 2% in the total exports. Only 1% of other items such as stethoscope, sphygmomanometer, etc are also being exported from Pakistan.




### 3.2 Country Wise Exports

Majority of surgical instruments export from Pakistan is destined to the USA. According to industry sources 70% of the surgical items manufactured in Sialkot are being exported to the US. The actual data presents a slightly different picture, a total of US $ 58 million, comprising 43% of the surgical goods export, is directed towards the USA. After America, Europe is another big market for Pakistani surgical instruments. Around 28% of the total exports are towards this region. Within the European region, Germany is the single largest importer of surgical instruments from Pakistan. 50% of the value instruments exported to Europe are imported by Germany followed by United Kingdom with 6% and Italy and France both with a share of 4% each. Based on the volume of instruments exported from Pakistan, America imports around 49 million units, which is 45% of the total exports of Pakistan. The rest of the volume is exported to Europe and other countries (see figure 7 for export volumes).

**Figure 6**
**Country Wise Exports of Pakistan 1997 (SITC 87229 & 87219)**




## 3.3 Export Market Segments of Pakistani Surgical Instruments

The surgical instruments manufactured in Sialkot can be classified into three broad categories:

### 3.3.1 Disposable Instruments

This particular category represents instruments, which are for a single use. These instruments constitute around 50% of the total export volumes of surgical instruments from Pakistan. Being single use instruments, they are manufactured from low quality stainless steel, which is produced locally and is available at nearly half the price of imported stainless steel. America is the largest market of these single use instruments, where these instruments are packed in sets, which are used to carry out simple surgical procedures.

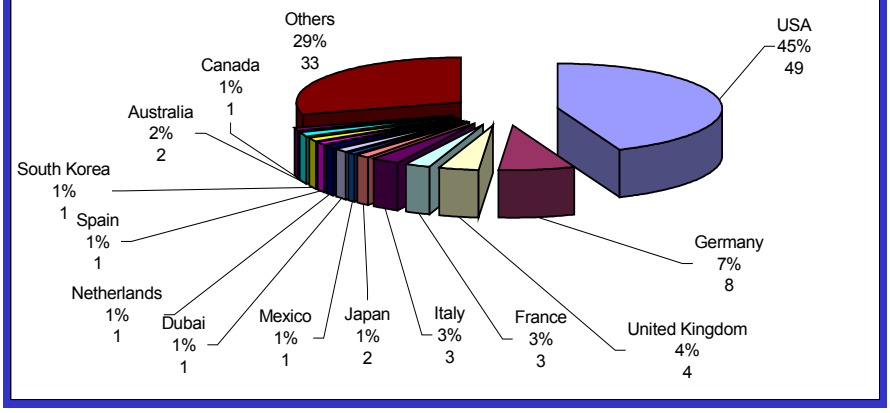
### 3.3.2 OR (Operating Room) Instruments

This category of surgical instruments represents the instruments, which are used in operating rooms to carry out complex surgical procedures. This segment includes over

30,000 different types and varieties. The OR instruments have to be reused and to maintain a desired level of sterility they are sterilized very frequently. This requires that the raw material used in the manufacture of OR instruments should be of proper grade so as to sustain the rigour of sterilization process. For Pakistani made OR instruments, Europe is the biggest market.

Most of the manufacturers of OR instruments use imported stainless steel. Due to the nature of the usage, special care has to be taken in the production of these instruments. Especially in the finishing process a great deal of skill and precision is needed to produce an instrument.

**Figure 7**
**Pakistan Surgical Instruments Export Volume (million)**

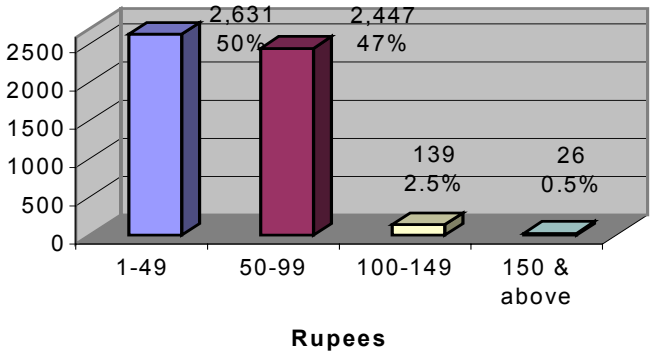



### 3.3.3 Manicure, Pedicure and Veterinary Instruments

Another category of instruments, which is also exported as surgical instruments, is the manicure, pedicure and veterinary instruments. Low volumes of veterinary instruments are exported from Pakistan to both Europe and America. Manicure and pedicure instruments include nail clippers, ring cutters, nail files, etc. which are exported in large volumes but it is not possible to find the exact number of instruments exported. According to industry sources, USA is again the largest market of such instruments.

Except for a few specilised manufacturers of manicure, pedicure and veterinary instruments in Sialkot, the producers of OR and disposable instruments also cater to this market segment. These manufacturers can easily switch to the production of such instruments without incurring any capital expenditure and modifying their production facility.

**Figure 8**
**Export Market Segments 1997-98**

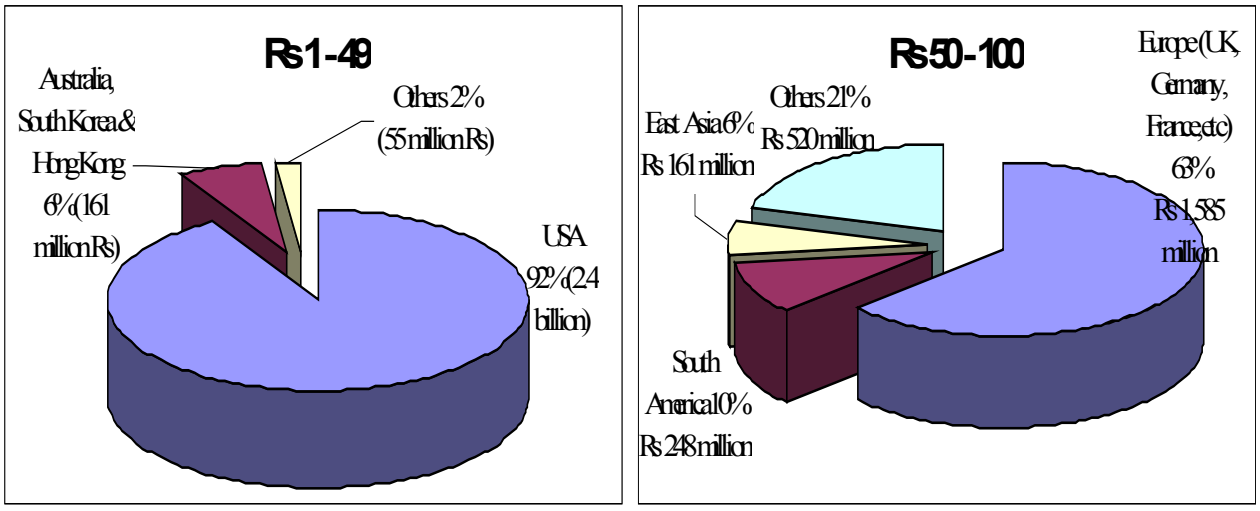



The exports of surgical instruments from Pakistan can be segmented into four broad categories based on the rupee value of instruments. As discussed earlier 97% of the surgical items exported from Pakistan fall under SITC 87229. Fig 7 above provides an analysis of the exports of this category. During the year 1997-98 the Rs 5,078 million worth of surgical instruments (SITC 87229) were exported. When divided into categories based on Rupee value it becomes very clear that Pakistan is selling 97% of its products valued at less than a hundred rupees to other countries. It is quite obvious that Pakistan is operating in the low value segment of the market. In dollar terms the export value per item comes to around US $ 2 per piece. The higher value segment, which is US $ 3 or above, comprises of only 0.5% of the total exports.

### 3.4 Destination Wise Market Segments

The less than a dollar worth of surgical instruments market, which constitutes 50% of the total, is basically the disposable instruments, majority of which are exported to the USA. Fig 8 depicts that 92% of Rs 1-49 (dollar or less than a dollar) per unit market, is dominated by the American imports. The other segment i.e. Rs 50-100 (two dollar) market segment, representing the OR instruments, is dominated by the European countries. Since this segment comprises of the re-useable instruments so the instruments falling in this category are able to fetch a better price in the international market due to higher quality as compared to the disposable segment being exported to the American market. The dental instruments manufactured in Pakistan can also be considered to be a part of reusable instrument segment. The export of dental instruments is much less as compared to the surgical instrument category.

**Figure 9**
**Destination Wise Export Market Segments of Pakistan**

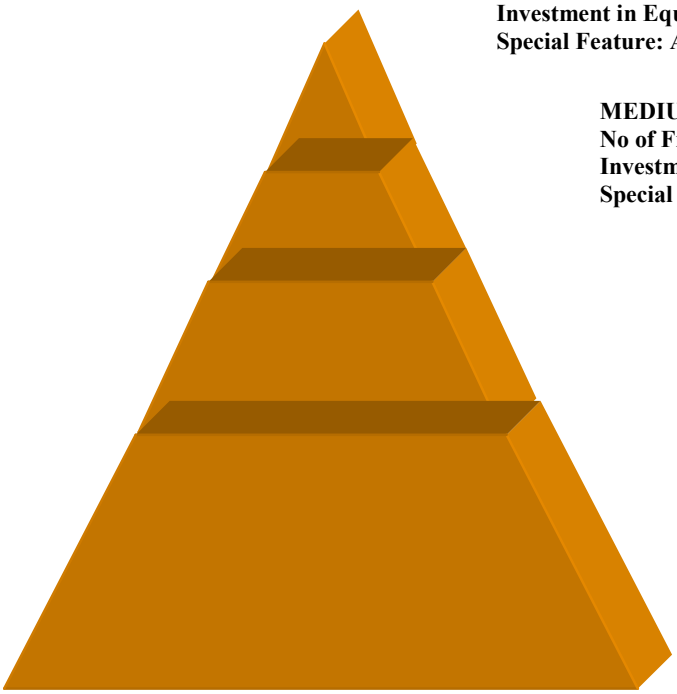


# 4 Pakistan Surgical Industry Structure

The entrepreneurial spirit of the people of Sialkot has enabled the surgical instruments industry to evolve from basic weapons manufacturing such as swords, daggers, etc. to highly sophisticated manufacturing of surgical instruments. There are thousands of different types and varieties of surgical instruments depending on the nature and complexity of the surgical procedure. Around 40,000 different types of instruments are mentioned in the catalogues of various surgical instruments manufacturers. According to the industry sources the surgical goods industry of Sialkot is capable of manufacturing about 10,000 different kinds of surgical instruments used to carry out numerous medical procedures.

The surgical goods industry of Pakistan can be classified into a number of segments. The total number of surgical instruments manufacturers including traders, registered with the Surgical Instrument Manufacturers Association (SIMA) is 478. The number of surgical instruments manufacturing units registered with Sialkot Chamber of Commerce and Industries (SCCI) is 1017. A very distinct problem with the industry is that it is extremely difficult to get hold of authentic information about the industry. Even SIMA does not have detailed information regarding its members. The individual industrialists, due to severe competition within the industry are not willing to share any kind of information. Considering such problems it becomes very difficult to classify the industry on the basis of investments in plant and equipment, number of employees, etc. The only other variable that can be used to classify the industry is the sales turnover. Usually the sales figure is directly related to the size of the manufacturing units.

**Figure 10**
**Surgical Instruments Industry Structure**
**Pakistan**



**LARGE: High Sales Segment**
**No of Firms: 20 Annual Revenues: Rs 60 - 100 million**
**Investment in Equipment: Rs 50 - 100 million Employment: 250 - 400**
**Special Feature: Almost all the firms have offices in importing countries**

**MEDIUM: Medium Sales Segment**
**No of Firms: 50 Annual Revenues: Rs 10 - 60 million**
**Investment in Equipment: Rs 10 - 25 million Employment: 100 - 250**
**Special Feature: Some of the firms have offices in importing countries**

**SMALL: Low Sales Segment**
**No of Firms: 150 Annual Revenues: Rs 1 - 10 million**
**Investment in Equipment: Rs 1 - 5 million**
**Employment: 30 - 50 employees**

**VENDOR SEGMENT**
**No of Firms: 2000**
**Annual Revenues: Rs 1 - 1.5 million**
**Investment in Equipment: Rs 50,000 - 1 million**
**Employment: 5 - 20 employees**

**TRADERS**
**Besides all the above there are about 800 - 1000 traders who do not have their own production facility**

## 4.1 Classification of Surgical Instruments Industry

On the basis of revenue the industry can be classified into four broad categories

### 4.1.1 Large Size (high sales segment)

Most of the firms in this category have annual revenue between Rs. 60 to 100 million, some have a turnover of more than Rs. 100 million. Almost all the units in this category are mechanised using imported machinery having an investment of Rs 50-100 million in equipment. There are about 20 such units in the industry, some of the units even use the state of the art machinery in manufacturing. These units provide employment to 250-350 persons. These large units of the industry contribute about 40% to the total exports of the surgical instruments sector. Almost all the firms in this class have offices in importing countries.

### 4.1.2 Medium Size (medium sales segment)

The total number of units comprising the medium sized segment is about 50 with the annual revenues ranging between Rs. 10-60 million. The investment of these firms in plant and equipment varies from Rs 10-25 million. The medium sized units provide employment to about 100-250 indviduals and some of the firms also have their own setup in other foreign countries.

### 4.1.3 Small Size (low sales segment)

The low sales segment comprises of some 150 firms. The annual sales of these firms ranges from Rs. 1-10 million per annum. The investment in plant and machinery of these firms lies between Rs 1-5 million. The low sales segment employ about 30-50 workers.

### 4.1.4 Vendor Segment

The labour regulations enforced in the early 1970s forced majority of the large size firms to considerably reduced the labour force to avoid problems arising out of increasing costs

and labour force management. The lay off was not only limited to the unskilled workers but also skilled workers became a part of it. This event played an important role in developing the vendors segment, which specialises in a particular process or processes of production. The number of these vendors in surgical industry, has increased over the period and currently there are about 2000 such firms which specialise in either one or more processes.

The annual revenues of firms in this segment ranges from Rs 1-1.5 million. As most of the firms in the vendor segment are involved in single process of production so thy have very low investments in plant and machinery, which lies between Rs. 50,000 – 1 million. One of the reasons for low investment in equipment is that a large majority relies on locally manufactured equipment and some even require very simple tools such as files and hammers as their equipment (hand filers and fitters). These units provide employment from 5 to 20 persons.

### 4.1.5 Traders

Besides all the above mentioned categories one category of traders, which is not involved directly in manufacturing, is also an important part of the surgical industry. These traders have no manufacturing facility of their own and only cater to small export orders. Due to wide spread vendorization in the industry most of the surgical instrument can be manufactured by outsourcing. There are about 800-1000 traders in Sialkot, some of them are involved in trading of multiple products such as sports goods, leather products, etc. and some are exclusively involved in the trading of surgical instruments.

# 5 Production Process (Value Chain)

In order to develop detailed understanding of the issues and problems faced by a particular industry, it is of prime importance that an in depth analysis of the value chain is carried out. During the process of production, value is being added at each stage of the

production, from the first stage of raw material to the final stage of finished product, a product undergoes a series of processes until it attains its final shape.

In the early phase of its evolution, the surgical industry of Sialkot used manual processes for the production of instruments. With the passage of time, through advancement of technology and increased awareness of the entrepreneurs, the industry has been mechanised to quite an extent. Machines have replaced a number of manual processes resulting in more precision and improved efficiency, but still some processes are carried out using obsolete technology.

## 5.1 Raw Material

Raw material is of utmost importance in the production of surgical instruments and forms the first fob of the value chain. The basic raw material used is stainless steel. Some other metallic alloys of brass, copper, titanium, grinding and polishing chemicals and wheels and abrasives are also used but in very small proportion as compared to stainless steel. (See Exhibit 2 for raw materials in surgical instrument manufacturing). Stainless steel is available in different grades and qualities, which depends on the attributes of the metal and purpose for which it is to be used, but the surgical industry uses only three grades. Stainless steel can be broadly divided into two categories:

### 5.1.1 Magnetic Steel

More than 95% of the instruments produced in Sialkot are manufactured from magnetic steel. Only two grades of this category produced in accordance with the American Iron and Steel Institute (AISI) are commonly used by the industry. AISI 410 and AISI 420 are the two grades of magnetic steel used by the surgical manufacturing industry. The low carbon grade is used to manufacture such instruments in which spring effect is required and the medium carbon one is used in the production of instruments, which need greater hardness specially in cutting instruments. The chemical composition of the two AISI grades of stainless steel is given in Table 2. The amount of carbon in the stainless steel determines the hardness of the material on heat treatment. It is seen in the table that the

carbon content of AISI 410 is less than that of AISI 420. Other elements except for chromium are present in both the grades in similar percentage.

**Composition of Class 4 Martensitic Stainless Steels %**
**American Society for Testing and Materials**
**Table 2**

| Type | Carbon | Manganese Max | Phosphorous Max | Sulphur Max | Silicon Max | Chromium | Other Elements |
|---|---|---|---|---|---|---|---|
| 410 | 0.09-0.15 | 1.00 | 0.040 | 0.030 | 1.00 | 11.50-13.5 | Ni: 1.00 max |
| 420 | 0.16-0.25 | 1.00 | 0.040 | 0.030 max | 1.00 | 12.00-14.00 | Ni:1.00 max |

### 5.1.2 Supply of Raw Material

The AISI 410 and AISI 420 grades are manufactured locally. Most of the surgical instruments manufacturers involved in the manufacturing of disposable instruments, catering to the American market, mostly use locally manufactured stainless steel. There are about 8 stainless steel melting units in Gujranwala which provide steel to the surgical instruments manufacturers of Sialkot on a sixty to ninety day credit basis. The Annual melting capacity of these small steel melting units is around 20,000 to 22,000 m.tones but the capacity utilisation is between 50% - 60 %.

The Gujranwala based units prepare stainless steel by melting scrap steel, obtained from local as well as and foreign sources, in a heat induction furnace. After melting and mixing of ferro-chrome to obtain correct analysis of chromium and carbon as per the grade requirement the stainless steel is rolled in the forms of sheets. Due to not obtaining analysis of all elements and in the absence of physical testing and metallographic checks and also the use of obsolete manufacturing process and improper raw material the desired quality of stainless steel cannot be produced. Most of the surgical instruments manufacturer also seem to complain about the sub-standard stainless steel being produced

locally. Some of the problems faced by the industry due to low quality local stainless steel are large wastage (upto 30%), increased costs (lesser life of dies and tools), etc.

The OR (Operating Room) instruments require high quality of raw material. Such manufacturing concerns involved in the production of re-useable instruments usually import stainless steel from foreign countries such as Japan, Germany, France, etc. Some stainless steel traders also import raw material from other countries. The reason why the manufacturers, catering to the European market, do not use locally manufactured stainless steel is that corrosion resistance is not guaranteed and it is only available in sheet form. Whereas, different instruments require raw material in different shapes and sizes such as flat, square, rounded, hexagonal and octagonal bars. There is wide price differential between the local and imported steel, the imported stainless steel costs more than double the price of locally manufactured one.

**Prices of Stainless Steel AISI 410**

**Table 3**

| Origin of Stainless Steel | Prices (Rs/lbs) |
|---|---|
| Pakistan | 20-25 |
| India | 44 |
| Korea | 44 |
| Japan | 48 |
| France | 65 |
| **Germany** | 60 |

According to Pakistan Customs Tariff, stainless steel is defined as the metal, which contains 1.2% or less of carbon by weight and 10.5% or more by weight of chromium. All the three grades of stainless steel used by the surgical instrument manufacturers i.e. AISI 304,410 & 420 fall within the specifications of stainless steel as defined by Pakistan Customs Tariff. Table 4 shows the region wise imports of stainless steel (including magnetic and non-magnetic stainless steel) in Pakistan. The figures in the table do not

provide a grade based break-up of the imports of stainless steel. It can be safely assumed that the 596 tons of stainless steel imported by the Sialkot and Gujranwala region is being used by the surgical industry with a small share of the cutlery manufacturing units in the total imports, which basically use the non-magnetic stainless steel grade.

The estimated total consumption of stainless steel by the surgical instrument industry is 16,000 tons per annum. Out of which 4,000 tons is imported and the rest is locally produced stainless steel. Due to certain reasons the import figures do not correspond to the consumption estimates. Firstly, the data is based on the Karachi port imports, other ports such as Lahore, Sialkot, Islamabad are not included. Some of the manufacturers also buy stainless steel from steel traders in Karachi, Lahore and Sialkot. Secondly due to improper systems of data reporting the goods get reported in different Pakistan Customs Tariff codes, which leads to distortion in the data.

**Import of Stainless Steel In Pakistan 1997-98**
**Table 4**

| Import Region | Quantity (KG) | Value (US $ ) | Average Value US $/KG |
|---|---|---|---|
| Karachi | 799069 | 3583182 | 4.48 |
| Sialkot & Gujranwala | 595721 | 790667 | 1.33 |
| Lahore | 123455 | 216226 | 1.75 |
| Faisalabad | 34230 | 68316 | 2.00 |
| Rawalpindi/Islamabad | 106107 | 200790 | 1.89 |
| **Total** | 1658582 | 4859181 | |

Source: Pakistan Revenue Automation Limited (PRAL)

### 5.1.3 Non-magnetic Steel

The non-magnetic stainless steel (AISI 304) is mostly used by the surgical instruments manufacturers to produce articles known as hollow-ware, such as kidney trays and dressing drums, etc. The items requiring this particular grade of steel are manufactured in very small quantities and the all the stainless steel of AISI 304 category is imported from

other countries. The locally manufactured non-magnetic steel is mostly used by the cutlery industry, located in Wazirabad. The composition of AISI 304 is given in Table 5

**Composition of Class 3 Austenitic Stainless Steels %**
**American Society for Testing and Materials**
**Table 5**

| Type | Carbon Max | Manganese Max | Phosphorous Max | Sulphur | Silicon Max | Chromium | Nickel | Other Elements |
|---|---|---|---|---|---|---|---|---|
| 304 | 0.07 | 2.00 | 0.045 | 0.030 | 1.00 | 17.00-19.00 | 8.00-11.00 | N 0.10 max |

## 5.2 Die Making

The importance of any process of manufacturing cannot be under estimated, but some processes are of crucial importance as the successful completion of other processes depends upon the accuracy and precision through which the process is conducted. In surgical instruments manufacturing die making is considered to be the critical stage. Different dies are required at various stages of production, such as blanking dies forging dies, cold stamping dies, etc.

The basic raw material required for these dies is die steel, which is normally imported at very high costs. The local industry in order to cut costs uses some substitutes of die steel, this includes steel from different sources, which can serve the purpose and bear the rigour of the processes in which dies are used. For this purpose die manufacturers use Gola, local name given to rail track and also axle steel, obtained from used axles of heavy vehicles, steels from some other sources is also used in the process.

Dies can either be made on machines or manually, usually the dies for items which are in great demand are made mechanically. Machines used in the process are:

- Hacksaw

- Copy Milling Machine
- Spark Erosion Machines
- CNC Wire Cutting Machines
- Heat-treatment equipment
- Surface Grinding Machine

Almost all the firms falling in the high sales segment have in-house facility to develop dies. Copy milling and spark erosion machines are also commonly used by this segment but CNC wire cutting and latest heat-treatment equipment is only available to 3 or 4 units in the entire industry. The smaller units out-source the process of die making. Some of the dies are still manually manufactured, this depends on two things. Firstly, if the order is of small quantity it is not viable to get a die made on machines and secondly, if the length of the instrument, for which the die is to made, is greater then the bed of the machines and equipment available. The problem with the manually produced die is that it lacks accuracy, which causes a great deal of wastage of raw material during the production process.

### 5.3 Steel Shearing and Blank Cutting

Stainless steel used in instrument manufacturing comes in different shapes and sizes. A vast majority of instruments are manufactured through stainless steel sheets. In the first step after sorting of the material the steel sheets are cut into strips of a definite size. These strips of stainless steel are then cut into forging blanks with cutting dies depending on the dimensions of a particular instrument. Equipment used in the process is:

- Shearing Machine (Strip Cutting)
- Eccentric Press (Forging Blanks)

### 5.4 Forging

Forging is the process of shaping malleable metals by means of hammers and presses. During this process the blanks are heated and while red-hot, the blanks are placed in a die

and struck with a hammer, as a result the blank acquire the shape of the die. The process of forging is also done using both the mechanical means as well as manually. This again depends upon cost factors. Large volumes mean use of mechanical process.

Even in the mechanical forging method, the surgical industry uses only single stage forging hammers whereas, the latest forging technique involves multi stage forging hammers in which the process of bending, if any, is also conducted at the initial stage rather than at a later stage, as in the case of local manufacturing. Similarly, in order to avoid scaling and wastage at the forging stage, the ideal method is to use temperature controlled furnaces, but no such manufacturing technique is used by the surgical instrument industry.

### 5.5 Annealing

During the forging process the metal due to high temperature exposure and rapid cooling becomes hard and brittle. To relieve the stresses from the forged instrument, the instrument is annealed by maintaining the forgings at a known temperature to homogenize metastable condition and to soften the metal.

In Pakistan several methods are used to anneal the forged metal. Some of the manufacturers use ordinary brick furnace, which is heated at a certain temperature and then allowed to cool down. Other methods used include pit type furnace in which the material is put in a pit a few feet deep pit and it is then heated to a certain constant temperature and allowed to cool down slowly.

The most amazing method of annealing used by the surgical instruments industry is the ‘Dried Cow Dung Method’ locally known as ‘Goya’. In this method the material is placed under a heap of Goya which is then set on fire, the goya after glowing for some time cools down slowly, the instrument is covered by goya dust and taken out after twenty four to forty eight hours.

In all methods mentioned above there is no proper temperature and environment control and the metal can only be annealed to get 12-14 HRC(Hardness Rockwell) which is not even uniform on different areas of the same instrument. Ideally, to properly anneal stainless steel (7-8 HRC Hardness Rockwell) it has to be heated to 1050° C and then allowed to cool down slowly. To achieve the desired level of hardness electronically heated, environment controlled pit type furnaces are used. To obtain homogenous annealing, through out the surface of the instrument, bell type vacuum furnaces are used. Another method and the most advanced method of achieving accuracy in the annealing process is the 'Solution Annealing', which leaves the metal uniformly annealed, having the same hardness through out the instrument body.

### 5.6 Trimming

In order to remove scale from the metal surface and debur the metal forgings from 'flash' on the sides of the instruments formed during the forging process. Trimming of flash is done firstly using a trimming die on the eccentric press and then the scale is removed using a Shot Blasting Machine. Very few units in the surgical industry have shot blasting machines, most of the units use a locally manufactured version of the shot blasting machine to debur the surgical instruments.

### 5.7 Machining

Machining is required to make flat/grooved surfaces, or to make ratchets, serrations and joints in the instruments. Most of the instruments manufactured by the surgical industry consist of pairs. The surfaces of the instruments, where the two pieces are joined together, needs to be smooth and highly precise so as to perform effectively and efficiently. The profiled surfaces are formed during the process of machining by using following equipment:

- Lathe Machines
- Milling Machines (Numerous Types)
- Drill Machines

The machining process requires high degree of precision and the quality of machining depends upon the accuracy of the processes carried out earlier, i.e. forging and annealing. The equipment also plays a crucial role in the machining process. Some of the manufacturers use high accuracy imported equipment capable of performing with precision but majority of the units use locally manufactured machines, which lack accuracy. The quality of tools and cutters used in the process is also of critical importance. In order to cut costs large number of manufacturers use locally manufactured cutters and tools which again are not heat treated to HRC 60-62, and not made of proper raw material and also according to exact specifications and design, this also adds up to inaccuracy in the machining process.

### 5.8 Filing and Grinding

After going through all the above mentioned processes the instrument is filed to remove any scale on the surface and to smooth out rough surfaces. This is a highly labour intensive process. Only hand files are used to carry out the process. It requires a high degree of skill. The initial fitting and setting of the instrument is also conducted manually at this stage. Instruments requiring cutting edges are also sharpened with the help of grinding machines during the processes of filing and fitting.

### 5.9 Heat Treatment

In order to perform good quality machining the surgical instruments are annealed. The process of annealing softens the instruments. To retain a peculiar shape, the instrument has to be hardened again. The instruments requiring spring effect in their functionality prepared by using AISI 410 grade of stainless steel which, require comparatively a lesser degree of hardness. Cutting instruments manufactured from AISI 420 stainless steel require a greater degree of hardness. Heat treatment is also a very critical process and if performed accurately a costly one too. Usually the Sialkot surgical industry employs three different methods to perform heat treatment:

- Oil Quenching Method
- Conveyor Belt Heat Treatment Furnace
- Vacuum Heat Treatment

The oil quenching method is a standard technique for heat treating surgical instruments. In this method the instrument is heated in a furnace and then quenched in oil. The drawbacks of this method are that a scale appears on the surface on the surface of instruments due to oxidation which, translates into additional costs. Another disadvantage of the method is that the furnaces used by the industry are not temperature controlled so the desired level of hardness cannot be achieved.

Another method for heat treating the instrument is using the conveyor belt system. The conveyor belt furnace is tunnel shaped, the instruments are placed on the belt and they are heat treated according to the requirement of the material. The advantage of using this system is that the desired temperature can be achieved. But due to high costs the conveyor belt system is also very uncommon in the industry.

The most advanced technique used for heat treating the instruments is the vacuum heat treatment. In this method the instruments are placed in vacuum furnace and heated at the desired temperature. After heating the instruments are quenched in liquid nitrogen. In order to relieve the instruments of stresses during the heat treatment and to remove the structural changes the instruments are also tempered using a vacuum furnace.

Vacuum heat treatment furnace is the single most expensive equipment used in the surgical industry. Only two to three units have in-house facility of heat treating the instruments using this method. A common facility providing vacuum heat treatment to the surgical industry is the Metal Industries Development Center (MIDC) of Sialkot.

**Heat Treating Guidelines and Typical Hardness Values**
**American Society for Testing and Materials (ASTM)**
**Table 6**

| Type of Stainless Steel | Heat Treatment Typical Hardening | Typical Hardness at Indicated Tampering Temperature | | |
|---|---|---|---|---|
| | | °Fahrenheit | °Centigrade | Hardness (HRC) |
| **AISI 410** | 1850°F (1010°C) | 500 | 260 | 43 |
| | | 700 | 371 | 43 |
| | | 900 | 482 | 42 |
| | | 1000 | 533 | 30 |
| **AISI 420** | 1850°F (1010°C) | 300 | 149 | 53 |
| | | 400 | 204 | 50 |
| | | 500 | 260 | 48 |
| | | 600 | 315 | 48 |
| | | 700 | 371 | 48 |

### 5.10 Electropolishing

Almost all the instruments after being heat-treated are electropolished using electropolishing equipment. Certain parts and sections of the instrument such as ratchets, serrations, etc. could not be properly polished and finished by the conventional polishing techniques so the instruments undergo this process. It restores the luster on the surface of the instrument. Some of the instruments after finishing are also electro-plated with gold and other metals as per requirement.

### 5.11 Finishing

Finishing of the surgical instruments is done by using a number of different finishing wheels, leather belts and brushes. In the first phase rough finish is done by leather grinding wheels. Grinding belts are used to perform finishing job on the inner sides of

rings of instruments like forceps and scissors. Wire brush wheels are used for finishing knurled components of the instruments. Final finishing is done with the help of buffing and satin finish wheels. Different types of chemical such as pink luster, white luster, emery, etc. is used in the process. Some of the instruments are also sand blasted to give a dull finish to the instrument. The job of sand blasting is done by using sand blasting machine which fires very fine sand particles on the instrument leaving the instrument with a dull finish.

The process is highly labour intensive, although performed on machines, the process demands great degree of precision and skill from the worker. Such labour intensive processes, requiring high skill, prove to be very costly in developed countries. It is for this reason that forgings are sent to Pakistan from countries like Germany where they are finished and sent back.

### 5.12 Testing and Cleaning

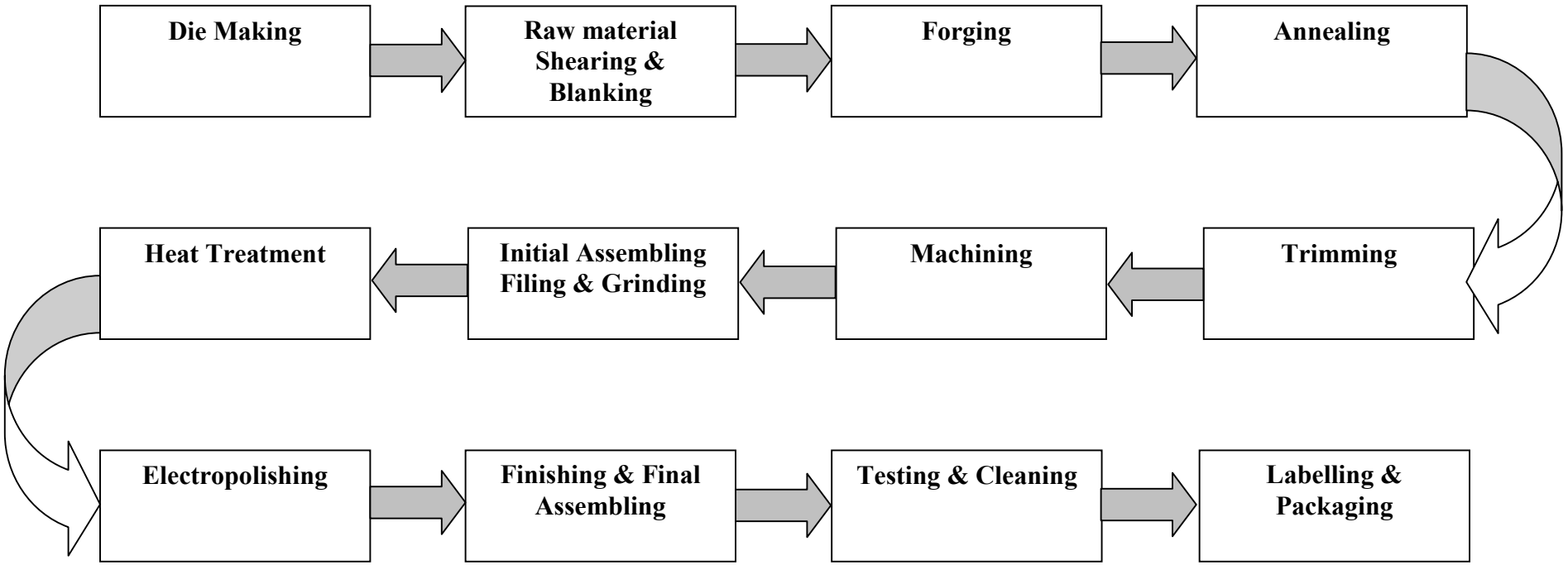
Before the instruments are finally packed they are tested so as to ensure the quality of instruments against corrosion etc. For this purpose first of all a boil test is performed in which the instruments are boiled in a metal water container and afterwards are checked for rusting and other deposits on the surface, if any. The other procedure performed at this stage is the ultrasonic Cleaning. During this process the instruments are placed in an ultrasonic cleaner with Trichloroethylene commonly known as Triclone N solution. The ultrasonic cleaner vibrates at a high rate and the temperature of the sump is kept around 200° C. This process makes the instruments free of any deposits and dust particles and, also to some extent sterile, from such part where ordinary method of cleaning cannot help.

### 5.13 Labeling and Packaging

This is the final stage of the production process. The instruments are etched with the required labels and markings with the help of electronic etching machines and stencils. Each instrument is finally packed in separate poly bags.

**Process Flow of Surgical Instruments Manufacturing**

**Figure 11**



# 6 State of Technology in the Industry

The surgical instruments industry in Pakistan started off with minimal of technology base and progressively adapted new methods and processes. Most of the processes used to be done manually with simple implements e.g. the entire die making and forging jobs were done manually. The people of Sialkot and the region surrounding it, have considerable ability not only to adopt new technologies but also to copy the same and start producing it indigenously.

Following the reverse engineering techniques a variety of simple equipment is being locally manufactured, except for some highly sophisticated ones. Mechanization in the industry started in the late 1960s. Most of the units now in the higher sales segment imported the equipment which was later successfully produced by the local facilities. This process facilitated the technical up-gradation of the industry at low cost.

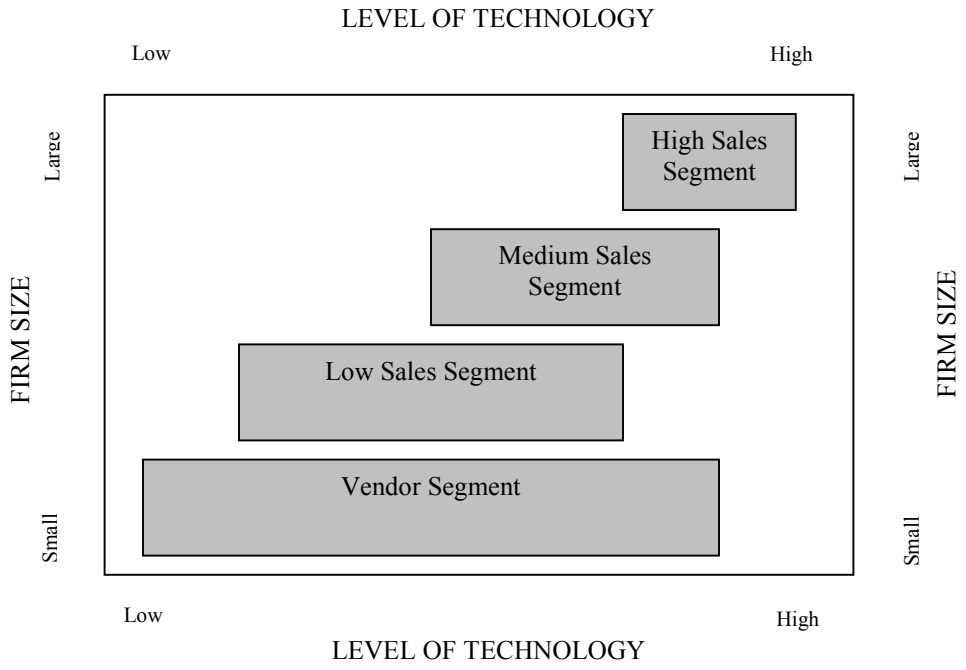
During the early 1980s, MIDC installed a Drop Forging Hammer, this was a new technique for the surgical instrument industry of Sialkot. Prior to the introduction of drop forging the industry was either dependent on manual forging method or the hydraulic forging machines, with both the techniques having their own drawbacks. As MIDC started providing forging facility to the domestic industry the locals of the area copied the design and the technology was introduced widely in the industry.

According to an estimate there are around 70 such forging hammers in Sialkot and a number of vendors providing forging facility, are located in Daska (a town 25 km from Sialkot). The details of equipment used by the surgical instrument industry are not documented. Considering the wide spread vendorization in the industry and the technology being used by some of the key industry players, the current level of technology within the industry can be understood with the assistance of industry structure mentioned earlier in figure 10. Most of the units in the high sales segment perform on an average 80-90% processes in house, including the most sophisticated ones such as the vacuum heat treatment etc. As we analyze the industry, moving down the pyramid, the level of sub-contracting increases. The vendor segment of the industry usually specialises in one or

two processes. It can also be observed that the vendor segment, inspite of its small size (based on sales) has some units, which perform technologically sophisticated processes such as, die-making by using spark erosion machines.

## 6.1 Technology and Vendorization

**Figure 12**

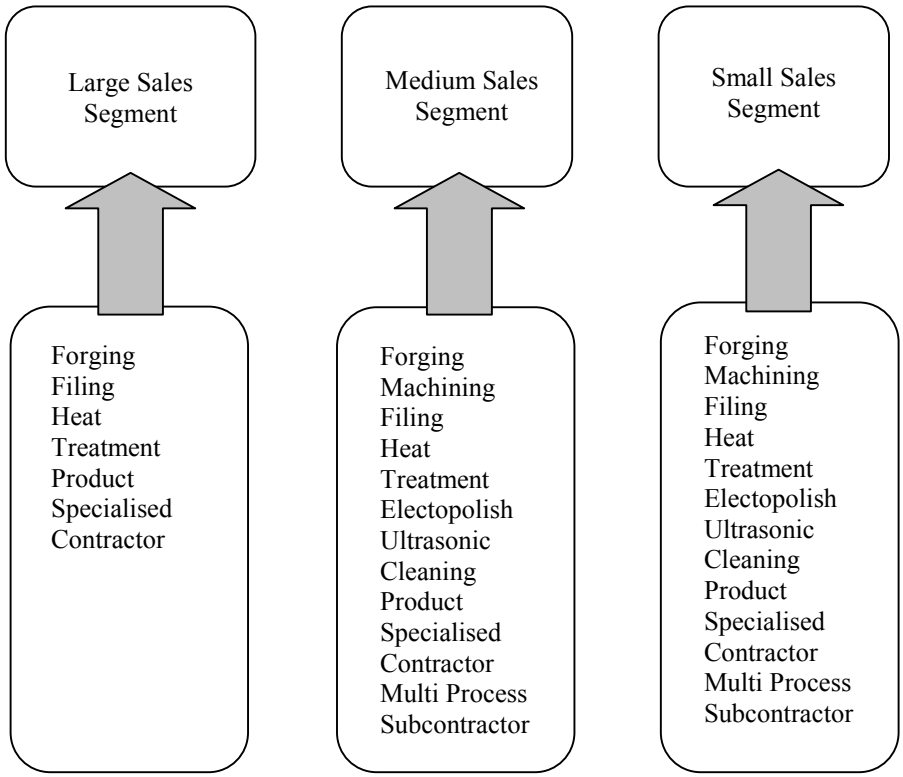



The increased costs of labour and the threat of labour organization within the firms due to the labour reforms introduced during the 1970's, forced the surgical instrument manufacturers to lay off labour in large numbers. These skilled and semi-skilled workers, already specialist in their fields, started working as contract labour for the surgical instruments manufacturers. This very phenomenon played a catalytic role in the development of the vendors, each one of them specialising in a process or processes.

The develolpment of vendors generated economies of scale for the manufacturer. The large size firms within the industry depend on the vendors for a few processes and the medium and small sized segment rely to a greater extent on the sub-contractors. One of the reason for lesser reliance of the large sales segment is that most of the firms within this category, manufacture OR

instruments which require greater level of skills and higher level of precision, and to achieve this, the processes requiring accuracy and considered to be critical in manfacturing are carried in house. Within the large sales segment, manufacturers catering to the US market (disposable instruments), rely for most of the processes on sub-contractors. Whereas the medium and small sized segments, usually involved in the manufacturing of disposable instruments sub-contract a larger number of processes, even the sophisticated ones.

**Backward Linkages in the Surgical Instruments Industry**
**Figure 13**




External economies generated through large number of vendors in the surgical instruments sector play a vital role in developing medium and small sales segment. Given the resources at their disposal, process specialised vendors enable the small and medium sized manufacturers to compete with the large sales segment within the industry structure. Due to the diverse range of

surgical instruments, some of the small and medium sized manufacturers lack facilities to develop specialised surgical instruments, the product specilised vendors in the industry also cater to this need of the industry.

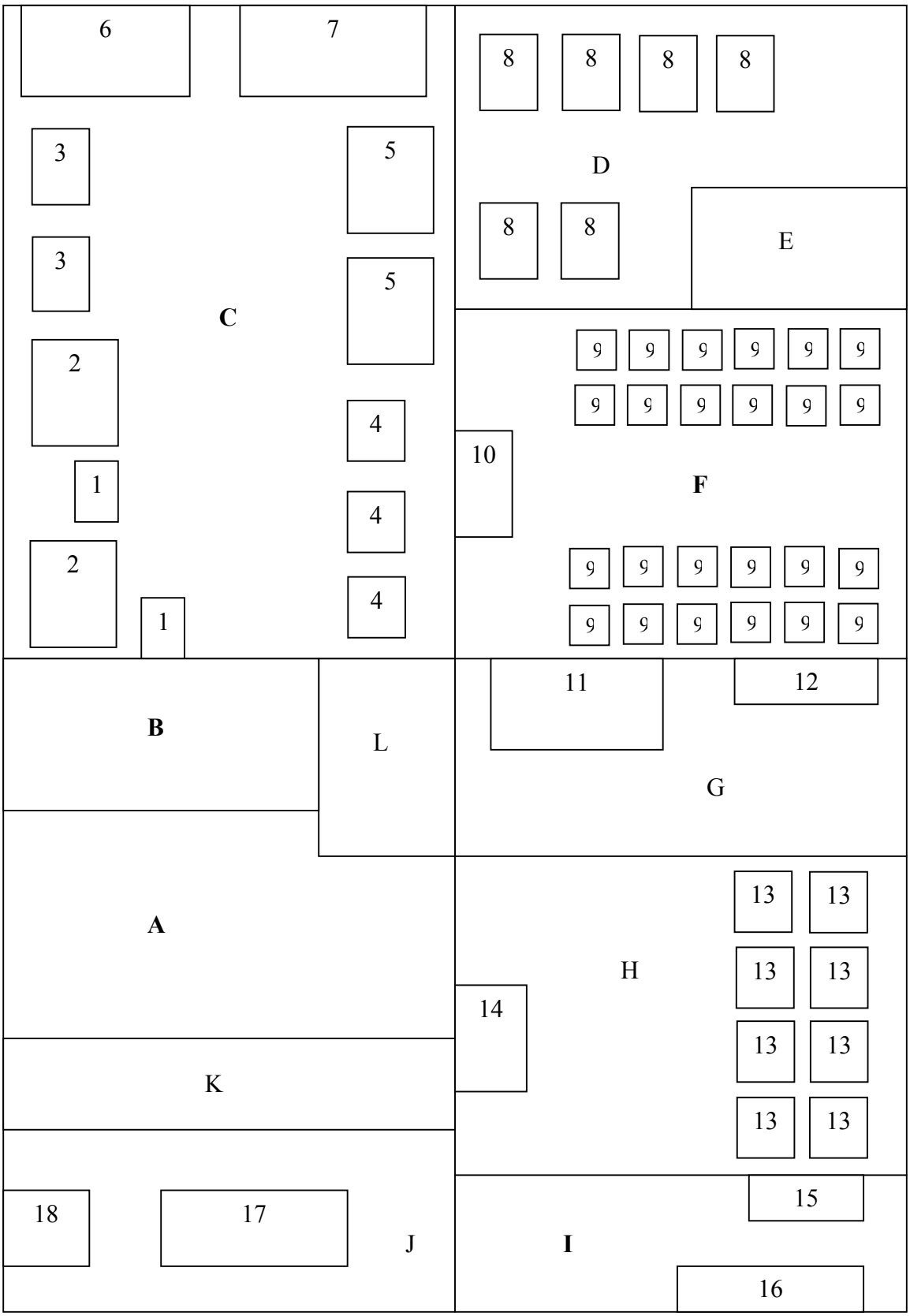
## 6.2 New Product Development

There are about forty thousand different types of surgical and dental instruments. Not any single manufacturing facility in the surgical cluster of Sialkot has the capability to manufacture complete range of instruments. The large sales segment and some firms from the medium sales segment, manufacturing OR instruments, venture to develop such instruments which have never been manufactured earlier in the local industry.

Due to the lack of proper infrastructure and expertise to develop new products, the industry depends on the reverse engineering techniques for such purposes. The standard approach of product development right from its concept to drawings to its final prototype is completely ignored by the domestic manufacturers. A sample of the instrument to be developed is broken into pieces. The technical head (usually the ustad heading the machining section) understands the basic mechanism of the instrument and then a prototype is prepared by replicating various components of the instrument. All the process of product development is carried out manually without the use of sophisticated equipment in order to keep the costs low. Such procedures of new product development adopted by manufacturers are although cost effective but lack accuracy, which can be obtained through modern equipment.

The Metal Industries Development Center (MIDC) of Sialkot has the necessary equipment such as Computer Numeric Controlled (CNC) wire cutting machine, Spark Erosion and Copy milling machine. The surgical instruments industry is of the view that MIDC even with the existing setup can provide the required support in new product development, by developing proper drawings, and preparing the instrument according to its exact specifications.

**Surgical Instruments Manufacturing Plant**
**Layout 100% In-house Manufacturing**
**Figure 14**




**1 Legend**

**A** Offices
**B** Raw Material Store
**C** Forging Section
**D** Milling Section
**E** Tool Making Shop
**F** Filing Section
**G** Heat Treatment
**H** Polishing & Buffing
**I** Cleaning Section
**J** Final Inspection & Packaging
**K** Finished Goods Store

**1** Forging Furnace
**2** Forging Hammer
**3** Friction Spindle Press
**4** Eccentric press (Blanking)
**5** Eccentric Press (Trimming)
**6** Annealing Furnace
**7** Shot Blasting
**8** Special Milling Machine
**9** Filers
**10** Filing Supervisor
**11** Heat Treatment
**12** Tampering Furnace
**13** Grinding Polishing Addas
**14** Sand Blasting
**15** Ultrasonic Plant
**16** Electroplating
**17** Inspection Table
**18** Etching Machine & Packaging

# 7 Surgical Instruments Manufacturing and Vendors

A typical surgical instrument manufacturing facility, with the capability to carry out 100% processes in-house, is shown in figure (#). The layout given, is a description of an ideal plant, which is designed keeping in view the process flow of surgical instruments manufacturing. Most of the properly designed manufacturing facilities are in accordance with the process flow of materials.

The labour-intensive processes require greater working area as compared to the capital-intensive processes. It is for this reason that the processes like finishing, polishing & buffing and filing need larger plant space than forging, heat treatment, etc. Usually, in a facility, with 100% in-house production, the labour-intensive processes occupy half of the total plant area. The constructed workspace in surgical instrument industry varies greatly depending upon the extent of processing. In case of small vendors it could be a couple of hundred square feet, whereas large firms may have thousands of square feet of covered workspace.

## 7.1 Profile of Vendors

Large scale sub-contracting in the surgical instrument manufacturing has led to substantial growth of process vendors. Some of these vendors carry out multiple processes and other just specialize in a single process. Such an industry structure enables to achieve economies of scale, with minimal capital investment a great deal of employment is also generated. The estimated total number of process vendors in the surgical instrument industry is more than two thousand. The investment outlay for each process vendor varies depending upon the technological requirement of the process.

### 7.1.1 Die Makers

All the instruments are transformed in their specific shape from stainless steel sheets with the help of forging dies. Some of the process vendors specislise in the manufacture of forging dies. The profile of these vendors differs according to the level of technology employed in making

dies. Some vendors manufacture dies manually without the use of sophisticated machines. The equipment used includes hammers, files, chisel, grinder and coal fired furnace. Such forging dies are usually used for instruments that are either to be produced in small volumes or the instrument length is such for which the die cannot be made mechanically. A typical manual die maker has a 100 to 200 sq. ft of workspace and employs two to three persons. The mechanical die maker, on the other hand uses Spark erosion machine, wire cut machine, copy milling machine and surface grinding machines to manufacture dies. Their investment in productive assets ranges from Rs. 0.5 to 1.5 million. Such a set up takes from 500 to 1000 sq.ft work area, but some of the vendors use even lesser space. These vendors employ five to ten workers including the skilled machine operators.

### 7.1.2 Forging Vendors

Similar to the die making, metal forging is also done both manually as well as mechanically. The forging vendor which carries out manual forging uses very simple implements such as hammers, files, coal fired furnace, and hand made dies to forge surgical instruments. The investment in equipment is negligible and usually the facility is housed in 100 to 200 sq. ft of area. The manual forging vendors employ two to three workers. After forging the process of annealing is done with cow dung, only a few manual forging vendors use locally produced oil fired annealing furnaces. Manual forging for instruments is rare nowadays due to wide spread technological awareness and easy availability of locally produced forging hammers. Such vendors are used only when there are low volumes and also when a prototype for an instrument is being made.

Ever since the introduction of forging hammers during mid 80's, mechanical forging has become very common. A cluster of forging vendors has developed in the town of Dusca near Sialkot, There are around seventy forging vendors in this area catering to the needs of surgical instrument industry. Some of the large and medium sized manufacturers also have in-house forging facility. The capital investments of the forging vendors range from Rs 0.5 to 2 million depending upon the type and quality of equipment. Most commonly used equipment includes, forging hammers, eccentric press, trimming press, shot blasting machine, annealing furnace, etc. The variation in the capital investment is due to the reason that a large number of vendors install second hand imported or locally manufactured machines. Such forging vendors employ 10 to 25 persons

including the skilled machine operators. The covered area of forging sub-contractor varies from 1000 to 3500 sq. ft.

### 7.1.3 Machining Vendors

The equipment used by machining vendors includes milling machine (various types), lathe machines, jigs and cutters, drilling machines, etc. Machining is comparatively less labour intensive process in the manufacturing of surgical instruments. The total investment of machining vendors in equipment ranges from Rs 0.1 to 1 million. The investment in equipment is directly related to the quality of equipment installed. A vast majority of machining vendors relies on second hand imported machines or locally manufactured (low accuracy) machines. A small size machining vendor has two to three milling and a lathe machine installed in its facility, whereas medium to large size vendors have 10 to 15 machine set up.

For machining process different milling machines are required to perform specific jobs such as to make rachets, serrations and also for box fitting of surgical instruments, that is why a minimum of three to four machines are required to operate even at a very small level. These machining vendors employ 5 to 15 persons, majority of the labour force employed is that of skilled workers who are capable of handling the machines. The total work area of machining vendors ranges from 200 to 1000 sq.ft.

### 7.1.4 Filing and fitting Vendors

Filing, fitting and grinding of surgical instruments is highly labour intensive. It requires very simple tools like hammers, hand files and grinding machine. All the work is carried out manually requiring great deal of precision and skill. Given the low technological requirement of the process, the investment in equipment is minimal. The number of persons employed ranges from 8 to 20. Almost all the labour force is skilled. The work space requirement of the machining vendors vary from 200 to 1000 sq.ft.

### 7.1.5 Heat Treatment Vendors

The conventional, oil quench, heat treatment is done by a number of vendors in the surgical instrument industry. Equipment employed by heat treatment vendors includes a simple gas or oil fired brick-lined furnace where the instruments are heated. The instruments after heating are quenched in oil filled drum. The investment of conventional heat treatment small-sized vendor ranges from Rs 30,000 to 100,000. The investment depends upon the number of furnaces installed. Some of the heat treatment vendors also perform the process of annealing, the investment in locally manufactured annealing furnace is between Rs 15,000 to 30,000, depending on the quality of the furnace. Such vendors provide employment to 5 to 15 persons, majority of the workers is unskilled, who are provided on the job training of skill development.

The other sophisticated method of treatment, vacuum heat treatment, the details of which are given in the value chain analysis, is only carried out by the MIDC. Some of the large size manufacturers have in-house facility to do vacuum heat treatment. Due to the large investment in the equipment, no vendor provides such a facility to the surgical instrument industry in Sialkot.

### 7.1.6 Polishing and Buffing Vendors

Polishing and buffing is also one of the most labour intensive process in the manufacturing of surgical instruments. A great number of polishing vendors are located in the surgical instrument cluster. Their investment in equipment are very low, te equipment used by them includes leather belts and leather grinding wheels which are driven by electric motors. These vendors provide employment to around 5 to 15 persons and almost all the workers are skilled workers. A high level of precision is required to for the job, as the general appearance and quality of the surgical instrument depends on the precision with which the process of polishing and buffing is done. The investment of such vendors ranges between Rs 10,000 to 100,000. Such a great discrepancy in investment outlay is because of the reason that some polishing vendors also provide sandblasting facility. The process of sandblasting is done with the help of a machine, which makes it capital intensive. The work area requirement of polishing and buffing vendors varies from 200 sq.ft to 1500 sq.ft depending on the number of polishing and buffing stations (addas) in the facility.

# 8 Quality Issues in the Surgical Instruments Industry

Quality has always been considered to be a critical issue for the surgical instrument manufacturers of Pakistan. Recently its importance has increased manifolds given the increasing global competition and new regulations being enforced by the developed countries. These regulations require the exporters of the developing countries to introduce systems focussing on the improvement of management, labour, technology, and all the other fields which in any way effect the firm.

For the past many years the surgical instrument industry has not given any importance to formally implementing any quality systems. It is not that they never followed any quality standards or quality came last in their list of essentials. Rather each manufacturer had its own informal quality system in place depending on the market in which it is operating.

## 8.1 Food and Drug Administration (FDA) Story

The major event which, forced the industry to adopt internationally recognised quality systems happened in 1989. The USA is a big market of disposable surgical instruments, about 45-50% of the total exports of surgical instruments are directed towards the US. One factor that determines the quality of surgical instrument is its anti rust property, which depends on the usage of proper grade of raw material (stainless steel).
The Food and Drug Administration of United States (FDA) has the regulatory authority to ensure quality of such instruments imported from other countries. During a quality check of a surgical instrument consignment from Pakistan, FDA found instruments with rust obviously made of stainless steel of improper quality. Basically the element which gives anti rust property to the stainless steel is chromium and the instrument which gets rust is made from stainless steel having less than the required amounts of chromium. (See Table 2 for composition of stainless steels).

Almost all the manufacturers catering to the American market use locally manufactured stainless steel. As mentioned earlier in the raw material section of value chain the stainless steel manufactured in Pakistan is made from scrap in which the required elements such as ferro-

chrome and carbon are added to achieve a particular grade. In the absence of proper testing facilities at each melting unit it becomes difficult to achieve exact composition of the alloy.

FDA in the first phase warned the surgical instrument manufacturer to use proper raw material grade otherwise the industry would have to face severe consequences. The industry did not give it a serious consideration even after repeated warnings by FDA. In May 1994 FDA imposed a complete ban on the imports of surgical instruments from Pakistan. This time FDA also dictated its terms that only such firms would be allowed to export their products, which qualify the Good Manufacturing Practice (GMP).

## 8.2 Good Manufacturing Practice (GMP)

GMP for medical instruments and devices provides a quality system, which includes requirements related to method used in and the facilities and controls used for designing, manufacturing, packaging, labeling, storing, installing and servicing of medical devices intended for human use.

GMP dose not provide the manufacturer with the details on how to prepare a specific product. Rather it provides a framework that all the manufacturers, in order to qualify for GMP, must follow by requiring that manufacturers to develop and follow procedures and fill in details that are appropriate for a given device. All this meant a lot of documentation and additional costs to the surgical instruments industry of Pakistan. In the beginning the industry was reluctant to adopt such quality systems, to them it was next to impossible to implement it in an industrial environment such as ours.

The Government of Pakistan realising the importance of the issue, tried to convince the industry that GMP, if not implemented would ultimately lead to the destruction of the industry. The surgical industry as in every critical time wanted the Government to take the initiative. Government on the other hand continued its efforts to negotiate with FDA on the issue. Finally the Government decided to allocate US $ 7000 per firm in order to get GMP Certification. An American consultant firm, Medical Quality Services (MQS) was awarded the contract to

implement GMP in the surgical industry. At present there are about 175 GMP certified surgical instruments firms in Sialkot.

**Extent of Quality Systems Implementation In the Surgical Instruments Industry**
**Table 7**

| | Number of Firms Good Manufacturing Practice (GMP) Certified | Number of Firms ISO 9000 Series Certified |
|---|---|---|
| Surgical Instruments Sector | 175 | 50 |
| Other Sectors | | 350 |
| Total | 175 | 400 |

### 8.3 ISO Quality Standards

Implementation of the GMP in the surgical instruments industry paved the way for the implementation of other similar systems in the industry. Most of the exporter realised the importance of the quality systems in the current global environment. As GMP formed the prerequisite for exporting to the USA, the manufacturers realised that one day the European countries might also come up with similar sanctions on the surgical instruments imports from Pakistan. The firms catering to the European market also started implementing ISO standards in their operations. It was also easier for the firms, which were into manufacturing of both the disposable as well as the reusable instruments, to implement ISO as a number of them had already qualified the GMP.

The Government of Pakistan also provided an incentive to get ISO certification by providing every firm, which qualifies for ISO, with Rs.200,000 subsidy. This step was taken in order to introduce a quality culture within the industry. It is also astonishing that out of total of four hundred (400) ISO certified firms in Pakistan, there are about 50 ISO certified companies only in the surgical instruments sector.

## 8.4 Threat of Another Ban

Inspite of the fact that almost all the companies exporting to the USA have GMP certification, still the future of the industry cannot be considered to be secure. One of the requisite of exporting surgical instruments is that with each consignment the manufacturer is required to attach the chemical composition certificate of the stainless steel. Given the existing setup, which lacks proper testing facilities and also the reliability of the process through which testing is done it is very likely that some day FDA would again impose another ban on the imports of surgical instruments from Pakistan.

Currently the industry uses the material testing facility at MIDC. It uses titration method to analyse the stainless steel. The industrialists are of the view that even this process, conducted appropriately, can give good metal analysis. But the human resource managing the testing facility of MIDC cannot be trusted and it is very easy to get a metal testing report by paying a couple of hundred rupees.

The metallographic techniques involve the use of emission spectrometers, which have the capability of analysing the metal accurately. There is no such facility available to the surgical instruments industry which could provide metal testing based on modern technology. The Government of Pakistan is aware of importance of testing lab but this issue of setting up a modern metal testing facility has been lying with Government Authorities for years without any positive movement.

## 8.5 Certificate of Europe (CE Mark)

The latest development in the field of medical device quality assurance system, is the CE mark. CE basically outlines the recent regulations for import of medical devices including surgical instruments in the European Union. CE is a quality system to ensure medical device safety as per the complexity of the procedure to be performed through it. CE harmonises manufacturing procedures and marketing requirements for 16 European Nations. It also ensures that with a single quality assurance system, a medical device manufacturer would be able to market new products in Europe without having to perform lengthy individual product certification procedures

beforehand. Initially June 1998 was set as the deadline to get CE certification, without which exports of medical devices to European Union would not be possible. Now a new deadline has been set to get CE certification.

In order to get CE certification, there are different quality assurance systems with their distinct requirements depending on the classification of medical devices. The surgical instruments being manufactured in Pakistan, fall in the 'Class I' products category. The products in this category can attain CE certification through self-declaration. Some of the manufacturers from the large and medium sales segment, who have also attained ISO certification, are already using the CE mark on their products, but still a large majority of the surgical instruments manufacturers has still not obtained either the ISO certification or the CE certification. In the coming years, quality systems are likely to play a vital role in determining the fate of surgical instruments exports from Pakistan. This was one of the reasons which forced the industry to implement quality systems on a much wider scale than any other sector in the country. The quality systems area is the one, which needs to be considered seriously so as to develop the surgical instrument trade on sound footings.

# 9 Human Resource in the Industry

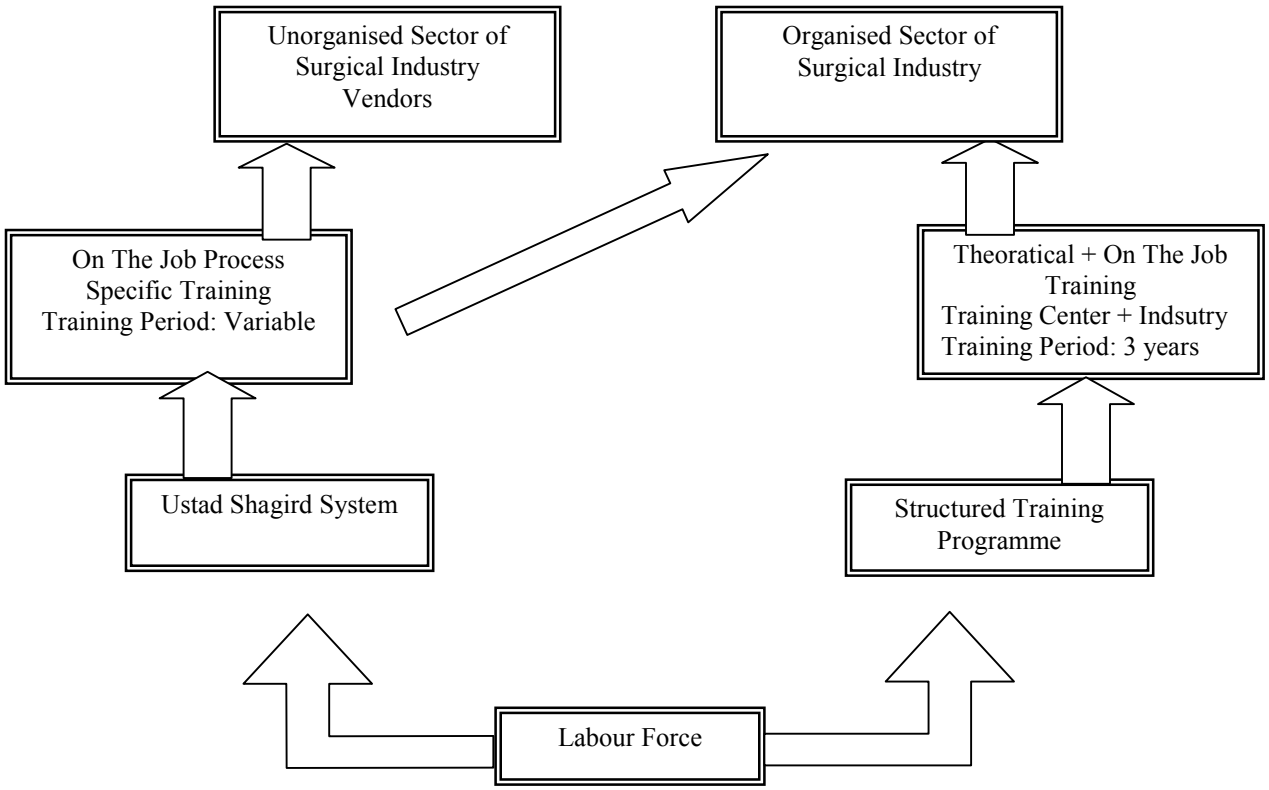
More than twenty five hundred large and small sized firms in the surgical instruments industry provide employment to 50,000 workers. The labour reforms introduced in the early 70s forced many large and medium scale manufacturers to slash the permanent labour force tremendously, in an effort to avoid problems arising from unionised labour and to reduce costs, incurred due to labour welfare and support regulations introduced by the Government.

This very phenomenon also brought a trend of hiring contract labour rather than full time manpower and also played a catalytic role in the development of small process specialised firms (vendors) in the industry. Due to the labour force size of the vendors, most of the firms are exempt from the labour laws, which are applicable on a manufacturing concern employing ten or more persons.

## 9.1 Manpower Training

The conventional method of training in the surgical instruments industry is based on the 'Ustad Shagird system' which is very similar to other industrial sectors in the country. The only difference in the surgical instruments sector is that it requires a great deal of precision and high quality craftsmanship to become a process specialist, particularly highly labour intensive processes such as hand filing and polishing require high degree of skill. The training of a person starts at an early age, the Ustad (trainer) teaches the Shagird (trainee) the fundamentals of a process. The training involves no theoretical or academic education rather it is 100% based on practical, on the job. The trainee is usually not required to have any basic education. The focus of the training programme is entirely on the skill development of the indvidual. The length of the training period is also not defined at the start, and it depends upon the perception of the trainer and on the time taken by a trainee to conceive all the important factors effecting a process. This traditional way of training lacks a systematic approach and other recognised standards, which form an integral part of a well-structured training programme.

**Workers Training in the Surgical Instruments Industry**
**Figure 15**




## 9.2 Organised Training Programmes

In addition to the conventional on the job training, the Government of Pakistan introduced an Apprenticeship Ordinance in 1962 for the purpose of imparting technical know-how and skill development, it also aimed at setting up certain minimum skill standards for the industries. The Government with foreign collaboration, also established five Apprenticeship Training Centers (ATC), one such center was also established at Sialkot to provide trained manpower to the export oriented industries of Sialkot, including surgical instruments industry.

The Apprenticeship Training Ordinance is applicable on firms having 50 or more full time employees. The employer bears the cost of the theoretical and practical training of the apprentice. Usually the apprentices in the surgical sector go through a three year programme

through out this time the employer pays 50%, 60% and 70% of the wages of a skilled worker, during the first, second and third year of training. The practical training is partially conducted both at the industry and ATC, while the theoretical part of the training is carried out only in the ATC. The split of theory and practical training is 20% and 80%.

### 9.2.1 Apprenticeship Training and The Surgical Industry

The surgical instruments manufacturers strongly feel that the ATC has not been able to provide the kind of support which was actually required by the industry. The syllabus of these center has not been updated and also the apprentices are not interested in learning. On the other hand they feel that the Ustad Shagird system is much better and they are able to develop the required skills in a much lesser time as compared to the legthy structured programmes of ATCs.

In addition to ATC, imparting industrial training is also one of the objectives of MIDC. In this area MIDC has also failed to come up to the expectations of the surgical industry. It only turns outs 11-12 skilled workers each year. The ATC provides training to about 150 apprentices each year, in different trades.

## 9.3 Other Government Departments on Labour

Besides serving the purpose of training and skill development, there are certain other Government departments which regulate labour related issues such as labour welfare and health care. The surgical instruments manufacturers consider these departments as redundant and mostly them as the major hindrance in the growth and development of the surgical instruments industry. These include:

### 9.3.1 Labour Department

The labour department ensures that the labour laws regarding the labour wages, work environment, labour securtiy, etc. are being properly implemented and observed in the industry. The laws are applicable on any firm employing 10 or more workers.

**Labour Force Surgical Instruments Sector (Labour Department)**

**Table 8**

| Category | No of Units | No of Workers |
|---|---|---|
| Registered Surgical Instrument Factories | 59 | 4574 |
| Unregistered Surgical Instrument Units | 815 | 5490 |
| **Total** | 874 | 10064 |

The figures of, total number of manufacturing units and employment in the surgical instruments sector, as reported by the labour department seems to be inconsistent with those given by the Surgical Instruments Manufacturer Association (SIMA), the Sialkot Chamber of Commerce and Industries (SCCI) and other industry sources. According to the labour department the number of registered surgical manufacturers, meaning the firms employing 10 or more workers, is only 59. The average employment in each firm of the organised sector comes to around 77 workers per firm, which is under much less than the actual. In the unorganised sector (vendors) first of all the total number of firms is too low and secondly the employment in this sector is also being under reported.

One of the reasons of such low level of documented employment could be the minimum limit of labour force, on which labour laws are applicable. Most of the manufacturing concerns in order to avoid the labour and its associated departments report a lower level of employees and this could also be the reason why the registered number of surgical instruments manufacturers is only 17% of the actual firms.

### 9.3.2 Employees Social Security Institution (ESSI)

The ESSI was established in 1965 with the objective of providing benefits to employees or their dependents in case of sickness, injury or death and other health related problems. Each firm employing 10 or more persons is liable to contribute 7% of the wage of an employee earning Rs.1950 per month to the ESSI. Rs 3000 per month of wage per employee, is the upper limit for

the contribution to the institution. The contributions are then mobilised to provide workers with medical health care facilities, employees pensions and labour rehabilitation programmes.

### 9.3.3 Employees Old Age Benefit Institution (EOBI)

The Employees Old Age Benefit Institution (EOBI) was established in 1976 with the purpose of providing financial security to employees in old age after retirement. Firms having 10 or more employees contribute 5% of the wages of an employee, regardless of the status or cadre of the employee. A firm has to contribute this amount for all the workers on the payroll earning the minimum amount. The upper limit of EOBI collection is also Rs. 3,000. EOBI after fund collection distributes it in deserving retired employees through its various pension schemes:

- Old Age Grant (pension scheme for individuals not entitled for pension)
- Survivor Pension (for widows of workers)
- Invalid Labour Pension (for disabled person)

### 9.3.4 Industry's View of Labour Welfare

The Sialkot surgical instruments manufacturers believe that all these institutions cause a great deal of loss to the industry. These institutions are an undue burden on the exporters financially as well as mentally. Considering it financially the costs arising due to these institutions do not exceed one percent of the total annual sales of a firm, even in case the firm reports the exact number of employees working in the facility. For the reason of avoiding these insubstantial costs the industry underreports the total number of employees. Most of the manufacturers believe that the informal labour welfare programmes of the firms are more effective for the workers than the Government managed welfare programmes.

## 10 Institutional Support to the Surgical Instruments Industry

There are certain organised bodies in the surgical cluster of Sialkot meant to provide support to the surgical instruments industry in various areas. The private as well as the public sector is managing these organisations.

## 10.1 Metal Industries Development Center (MIDC)

MIDC was established in 1943 by the British Government in Sialkot, with the objective to supply and serve as an inspection agency for purchasing surgical instruments for the field hospitals of Allied forces. It was technologically upgraded in 1945 and later in 1947 to provide technological assistance and advisory service to the metal related industries of the region. During 1993-94 MIDC had a staff of 67 individuals. Its total revenues were Rs. 4.6 million and expenditures were to the tune of Rs. 13.1 million. The shortfalls in the expenditure were met by the Punjab Provincial Government.

### 10.1.1 Foreign Assistance

In 1982 the Government of Pakistan allowed duty free import of drop forging hammer. MIDC pioneered the introduction of this forging technology in the surgical instruments industry. Large scale upgradation of MIDC occurred during 1984-86 with the cooperation of the Dutch Government. During this period state of the art equipment was setup at the facility. This included three vacuum heat treatment furnaces, computer numeric controlled machine (CNC) wire cutting machine, spark erosion machine and copy milling machine. Since that period no major technical upgradation of the facility has taken palce.

### 10.1.2 Common Facility Services

Various facilities at MIDC are meant to serve as common facility to the surgical instruments and other metal related industries in the region. The center served the industry very efficiently with the support of GTZ during mid 80s, but after the withdrawl of GTZ's support the quality of these common facilities has deteriorated considerably. The most frequently used service is the vacuum heat treatment. Almost all the firms from middle and small sales segment benefit from this common service due to the high capital cost involved in setting up in-house sophisticated heat treatment unit. Other facilities including forging, die making, and machining are rarely used by

the surgical instruments industry because of the poor services of the center, as perceived by the industry.

### 10.1.3 Testing Facilities

The testing facility of MIDC provides boil test, electrolytic degreasing test and also metal composition test. The center lacks latest metallographic equipment which is why the results achieved through conventional methods such as titration and other chemical analysis techniques are not accurate. The surgical instruments manufacturers are required to send material testing report with each consignment, that is being exported. The metal testing report of MIDC, according to the surgical industry, is not reliable. Even to the extent that accurate reports can be obtained by paying small bribes to the MIDC staff. Which could become a strong reason, leading to another ban on the exports of surgical instruments from Pakistan. The proposal for up-gradation of MIDC's testing facility is lying with the Government of Pakistan for the past many years without any further development on the issue.

### 10.1.4 Technical Training and Technology Transfer

With the objective of providing the industry with skilled manpower, MIDC has also technical training programmes in place. The center offers numerous short and long term courses to various age groups of workers to equip them with technical know how and provide the industry with highly skilled manpower. MIDC's training programmes have palyed a very limited role in providing the industry with skilled labour force. It hardly provides training to 7-8 workers each year.

Transfer of efficient and advanced technology to the industry is also an important function of MIDC. But the center is not active in this area since early 80s when it introduced forging hammers in the surgical instruments industry, which are now widely used by the surgical instruments manufacturers. The industry also benefited from technologies such as heat treatment, shot blasting, and other modern techniques of production, which were transferred to the industry through MIDC.

### 10.1.5 Other Services

Besides serving as a common facility center, one of the objectives of the center is also to provide advisory services and assist in ventures like new product development. Due to a very passive role of the center, MIDC has not been any great support to the surgical industry, especially after the withdrawal of support from GTZ. The large sales segment of the industry which occasionally uses MIDC's facilities thinks that even with its existing setup the center can play a central role in industry's (particularly the high sales segment) effort to move to higher value added products, through new product development.

MIDC also provides financial support, catering to the small sized firms in metal related industry through its small loan schemes. The credit line for these loans comes from the Punjab Small Industries Corporation. It offers Rs.45000 credit on a subsidised interest rate of 7%, payable over a period of three years.

## 10.2 Sialkot Dry Port Trust (SDPT)

Sialkot Dry Port Trust is an excellent private sector initiative to collectively resolve the, industry's problems. Before the 1980's majority of the export shipments were either routed through Karachi or Lahore, leading to greater hassle in custom clearance and transportation of merchandise. The SDPT was established as a bonded warehouse in 1984. Initially fifty two (52) industrialists from Sialkot contributed Rs.10,000 each. The land was provided by the Government on lease for the purpose.

### 10.2.1 Income and Funds of SDPT

The initial investment was used in construction of sheds for the warehouse, with the passage of time the Trust besides serving as a warehouse, also started transporting goods from Sialkot to Lahore and Karachi. SDPT suffered losses until 1992, the shortfalls were met with bank financing on personal guarantees of the Trustees.

The Trust employs 340 individuals and has also established three terminal offices in Lahore, Karachi and Islamabad. During the year 1997-98, SDPT earned a profit of around Rs.10 million. It owns twenty-three (23) vehicles, and also uses a number of contract vehicles to transport goods. During the same period 1997-98 the Trust handled US $ 580 million of shipments.

Not only the surgical instruments sector benefited from this initiative but it also assisted in smooth management of consignments of all the export oriented industries in the region. Whole of the surgical instruments industry seems to be satisfied with the services provided by SDPT and its efficient management.

### 10.3 Surgical Instruments Manufacturer Association (SIMA)

The Surgical Instrument Manufacturer Association replaced the Surgical Instrument Traders Association after the partition in 1947. The Ministry of Commerce incorporated the Association as a, representative body of exporters and manufacturers of surgical instruments, in 1958. At present SIMA has 478 members representing various manufacturers and traders of surgical instruments.

The basic objective of SIMA, like all the other trade bodies, is to safeguard the interest of surgical instrument industry and also to collectively represent the industry on various forums. The Association also publishes a monthly newsletter, 'The Surgi-News'. The contents of this publication focus on the issues faced by the industry, trade queries from foreign countries, information on trade shows and data regarding the trade of surgical instruments. SIMA plays the central role in nominating trade delegations and participants for trade fairs and exhibitions. The Association also represents majority of the disputes regarding customs and tax matters and other industry grievances with Government agencies.

The small and medium sized manufacturers consider SIMA, to be dominated by the large players in the industry. Inspite of the long list of objectives on SIMA's agenda, the ground reality is somewhat different. Due to the politics within the industry, the Association's role has been

limited to the welfare of few individuals rather than focussing on the development of the cluster as a whole.

# 11 Indvidual Market Analysis for Surgical Instruments

More than 95% of the total production of surgical instrument in Pakistan is exported to different parts of the world. Major importers of Pakistani made surgical instruments have already been discussed earlier. This section will focus on more detailed analysis of the two major importing regions, the United States of America and Europe.

## 11.1 The US Market

The USA is the biggest market for disposable (single use) instruments manufactured in Pakistan. Based on the US $ value, America's annual spending on health is the highest in the world. During the year 1996the national health expenditure in USA was $ 1,035 billion, which was 13.6% of the US Gross Domestic Product (GDP). The Federal Government spent $ 351 billion on health, 20.7% of the total Federal Government expenditure. The total number of hospital, including Federal and Non-Federal, in 1996 was 6,201. The total number of beds in these hospitals was reported to be more than 1 million, with an annual occupancy of more than 60%. Considering such a large number of hospitals and high per capita medical expenditure, it can be safely assumed that thousands of surgical and medical and diagnostic procedures are carried out each year. All these procedures involve heavy usage of surgical instruments. According to Federal Statistics during 1996, more than 22 million different inpatient surgical procedures were performed.

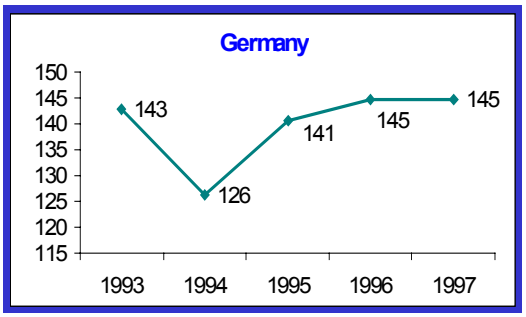
### 11.1.1 US Imports

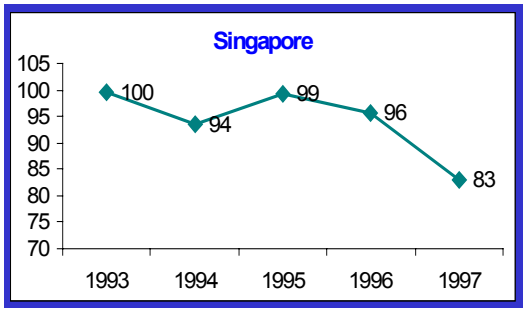
The overall annual consumption of medical, diagnostic and surgical instrument in the US is around US $ 62 billion. The total imports of surgical instruments were around US $ 1 billion during 1997. Some of the multi-national companies such as Johnson and Johnson, Baxter, etc besides manufacturing a diverse range of medical and diagnostic equipment, also manufacture surgical instruments. It is very difficult, rather impossible, to get the details of the types of instruments which are traded. Analysing the data, based on Harmonised System, at a 10-digit level, the maximum extent to which data can be accessed, only provides information on the

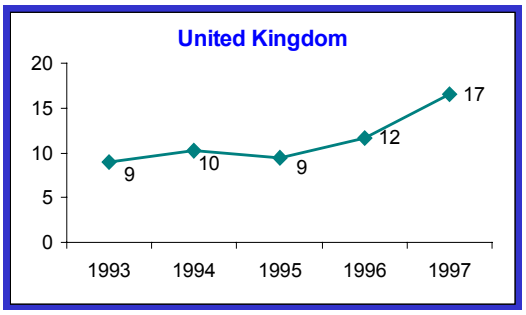
surgical instruments. Details regarding the types of instruments, which is in thousands, could not be obtained. The surgical instruments, under the HS codes, are reported in 9018908000.

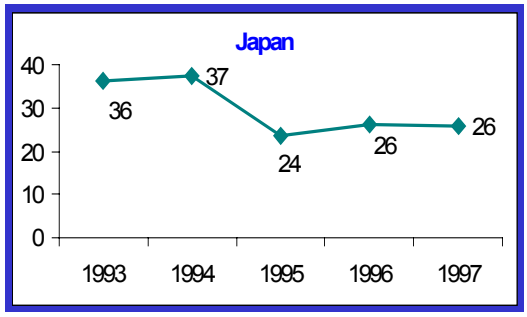
USA imported around US $ 1 billion worth of surgical instruments during 1997. As mentioned earlier that it is difficult to get details about the types of instruments imported. The units of instrument (weight or number) is also not mentioned in the data, which makes it very difficult to even get some idea about the average prices of the imports. The American imports and the trends during the last five years can be observed in the figure 16.

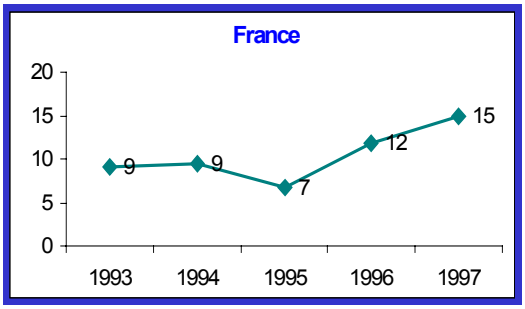
Figure 16
American Imports of Surgical Instruments I

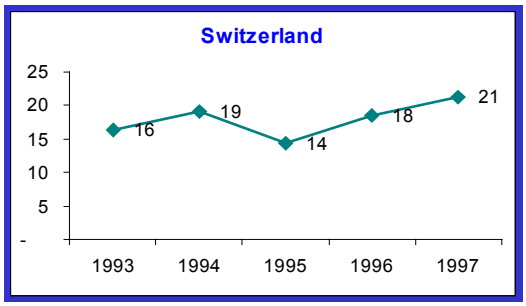


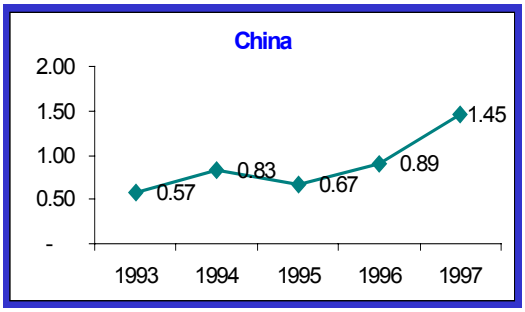



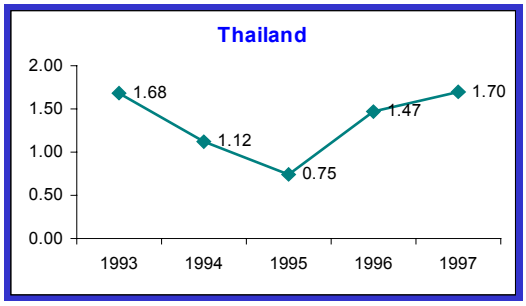



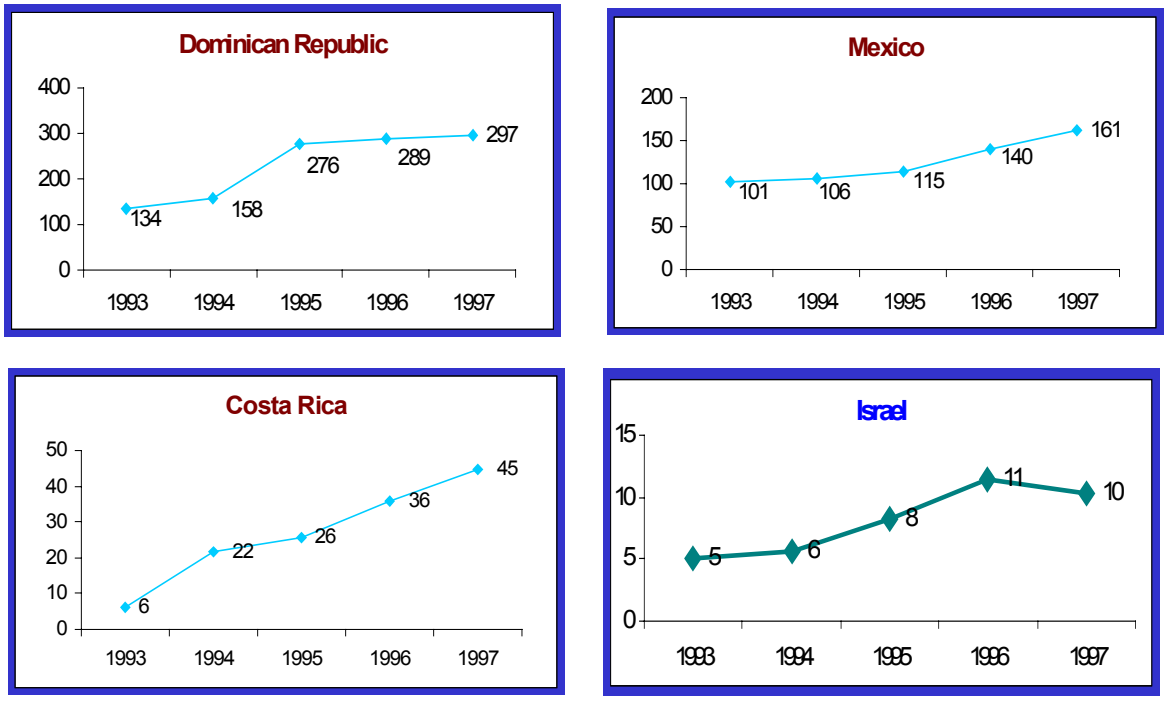



As it can be observed in the figures, among the European countries, Germany is the largest exporter of surgical instruments to the USA. Considering the global position of German surgical instrument manufacturers and the market brand perception, Germany is the brand leader in the surgical instruments. It can be assumed that German exports to USA comprise of high value OR instruments. Other European countries have a small share in the American market.

An important phenomenon that can be observed in the country export trends to the USA is the increasing market share of North and Central America (Dominican Republic, Costa Rica and Mexico). The dollar value of exports from these countries has increased even 100% over a period of five years. The exports of Dominican Republic were US $ 134 million in 1993, which increased to US $ 297 million.

One reason of this increase in imports from North and Central American countries is the investment by American multi nationals in this region. The manufacturing of surgical instruments, unlike the other engineering industries, is highly labour intensive the increasing labour costs in the United States could be one of the major factors behind moving to low labour cost regions such as Mexico, Dominican, etc. Some of the companies like Johnson and Johnson have also established their manufacturing concerns in Mexico. A big proportion of the production is exported to the USA.

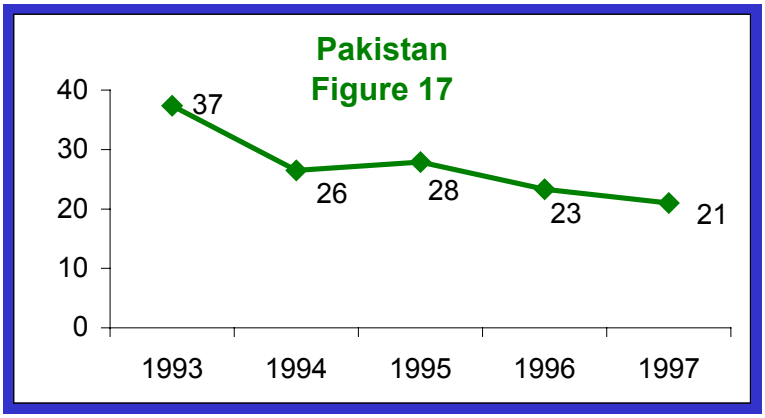
Figure 16
Amercian Imports of Surgical Instruments II




### 11.1.2 Pakistan's Exports to the USA

USA is the biggest market for Pakistani made surgical instruments. Pakistan surgical instrument industry caters to the disposable instrument segment in the USA. These instruments are low value and are meant for single use. Besides exporting surgical instruments to the USA, a large volume of pedicure and manicure instruments, scissors for other purposes, etc, which do not come under the surgical instrument category, are also exported from Pakistan. It is for this reason that there is always a discrepancy between the data reported by Pakistan and the one reported by the USA, the latter is less than the former.

During 1997, based on Pakistan's data, US $ 58 million worth of surgical instruments were exported to the US. The total volume of exports was around 49 million units. During the same year, according to American statistics, US imported only US $ 21 million worth of surgical instruments. Actually the problem lies in the data reporting system of Pakistan. A large number of articles like manicure and pedicure instruments, general-purpose scissors, which are not surgical instruments, are declared as surgical instruments at the time of shipping, which leads to greater discrepancy in data.

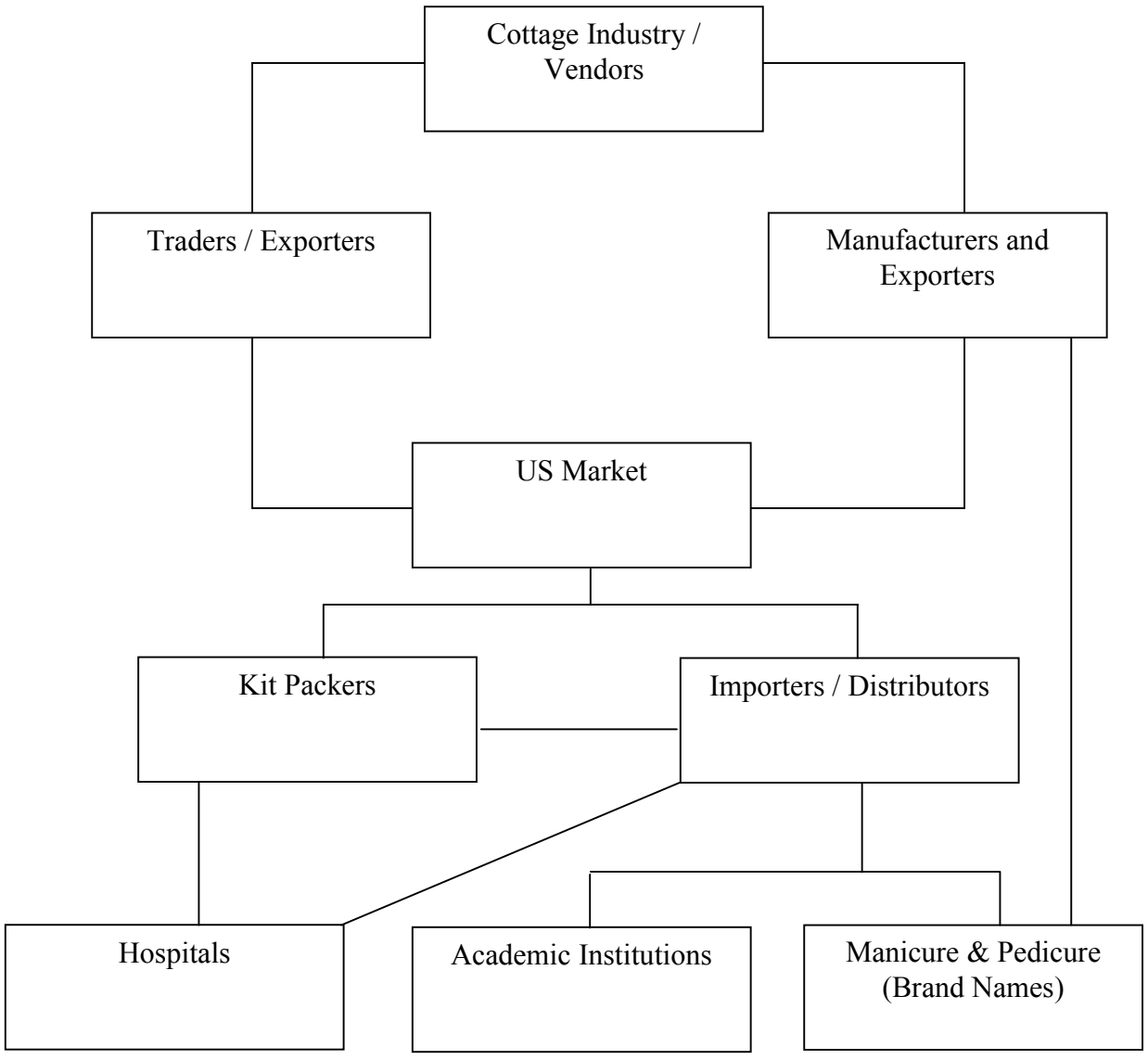



### 11.1.3 Product Market Segments in the US

American market has a unique position as compared to other surgical instrument markets. The unique feature of the market is the use of disposable instruments. These instruments such as scissors, forceps, etc. are not supplied separately to the end user (hospital and clinics). In fact these instruments are combined with other articles which are to be used in a particular procedure and a complete set of gadgets, called procedure kits, is supplied to the end user. The use of the disposable procedure kits has gained popularity due to the increased risk of contracting HIV and hepatitis viruses. It is again very difficult to determine the exact number of kits that are used in the American health system but there is a diverse range of such kits which varies according to the nature of the procedure to be performed. Some of the procedure kits can be seen in the Exhibit 3.

### 11.1.4 Distribution Channel for Surgical Instrument in the US

**Figure 18**
**Distribution Channel US Market**



The surgical instrument cluster comprises of a number of manufacturers and traders. These either manufacture or procure the required instruments for exports. The US distribution channel mainly consists of the following

#### 11.1.4.1 General Medical Supplies Distributors

The general medical and surgical supply distributors supply a variety of items to the hospitals. These may range from very simple cotton gauze to very sophisticated electro-medical diagnostic equipment. These distributors supply not only to the hospital but also cater to the medical colleges and other training institutions related to the medical profession. Most commonly supplied items include dissection sets, which consists of some basic surgical instruments. These distributors also supply veterinary and manicure and pedicure instruments. A few Pakistani manufacturers also supply manicure and pedicure instruments directly to the brand names such as Revlon.

#### 11.1.4.2 Kit Packers

Besides the general medical supplies distributors, there are a number of surgical procedure kit packers, which form an important part of the surgical instrument distribution channel in the United States. These kit manufacturers import surgical instruments from Pakistan, the instruments along with other necessary items are packed and sterilized with gamma radiation. These disposable kits are then supplied to various hospitals for use. The instruments and other contents of these kits are for single use, all the instruments, either of stainless steel or plastic are thrown away after the procedure has been performed. Majority of the kit packers usually imports surgical instruments directly from Pakistani manufacturers but at times they also purchase Pakistani made instruments directly from the local distributor. The distribution channel for surgical instruments can be seen in the figure 18.

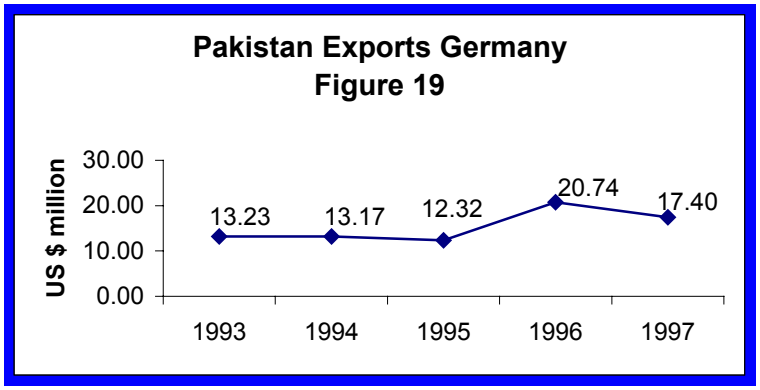
## 11.2 The European Market

The European countries form the second largest market for Pakistani surgical instruments. Unlike the American market, the European countries import the Operating Room (OR

instruments) from Pakistan. As this the reusable quality of surgical instruments, therefore, the per unit value of these instruments is much higher from the disposable instruments category. Characteristics of the major European importing countries are given.

### 11.2.1 Germany

Germany is considered to be the leading manufacturer of surgical instruments in the world. Some of the well-established and world-renowned brand names in surgical instrument manufacturing are located in Germany. Another feature of the German market is the existence of surgical instrument manufacturing cluster in the country. Like Pakistan, surgical instrument manufacturing in Germany is concentrated in two small towns, Tuttlingen and Sollingen. Besides the concentration of brand names, these two towns also have a number of traders and distributors who are associated with the surgical instrument trade. Some of the distributors, after importing instruments from one country re-export it to other countries. The German manufacturers and distributors import considerable quantity of OR grade instruments from Pakistan each year. During the year 1997, US $ 17 million worth of surgical instruments were exported to Germany, this accounts for 13% of the total exports of surgical instruments from Pakistan.




The exports of surgical instruments have grown at an average 9% during the period from 1993 to 1997. The USA is the largest exporter of surgical instruments to Germany followed by United Kingdom and Switzerland. A detailed overview of five years country wise exports and imports

of Germany can be seen in the Annexure A, which is based on SITC 87229, representing a broader category.

**Germany Surgical Instrument Imports US $ 000**

**Table 9**

| | 1992 | 1993 | 1994 |
|---|---|---|---|
| USA | 101,603 | 108,165 | 97,059 |
| United Kingdom | 28,095 | 25,656 | 31,120 |
| Switzerland | 25,508 | 29,458 | 25,387 |
| **Others** | 147,326 | 138,497 | 126,863 |

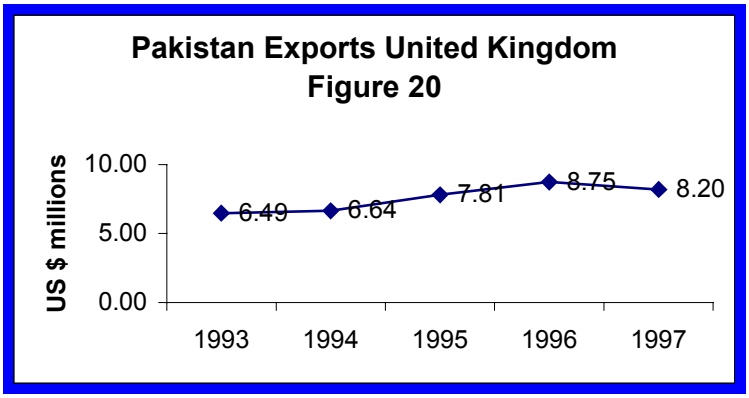
Source: CBI Center for Promotion of Exports from Developing Countries, Netherlands 1995.

The German surgical instrument manufacturing industry comprises of more than 50 firms, most of which are located in the two towns. These manufacturing concerns manufacture products ranging from very sophisticated orthopedic implants to very simple surgical and medical instruments. Other medical equipment manufacturing companies produce a diverse range of appliances and medical instruments. The total production of the various segments of medical devices in Germany during 1998 was to the tune of US $ 9.7 billion.

### 11.2.2 United Kingdom

The United Kingdom is the second largest European importer of Pakistan made surgical instruments. The UK market of surgical instruments is slightly different from other countries. Some of the local Pakistani firms have representative offices, which are incorporated in the UK and serve as intermediary for the Pakistani surgical instruments. As presented in the industry pyramid (figure 10), this represents a very small segment of the total surgical manufacturing and trading companies but it definitely enables them to get hold of better information and knowledge about the European surgical instrument markets. The UK market is very similar to the German

market in the sense that there are also a number of surgical instrument manufacturing companies and some brand names, but the size of the industry is much small as compared to that of Germany.




During the year 1997, Pakistan exported a total of US $ 8.2 million worth of surgical instruments to the UK. A total of 4 million units of various surgical instruments were exported to the UK, which accounts for 4% of the total volume of surgical instrument exports from Pakistan. The average rate of growth from 1993 through 1997 was around 5.3%. The total imports and exports (SITC 87229) can be observed in Annexure A. Top three exporting countries to the UK during the period from 1992 through 1994 is shown in the Table 10. More than 50% of the total import value comes from the USA. The others category here represents number of different countries which export small amounts of surgical instrument to the UK, this also includes Pakistan.

**UK Surgical Instrument Imports US $ 000**

**Table 10**

| | 1992 | 1993 | 1994 |
|---|---|---|---|
| USA | 107,657 | 140,666 | 146,515 |
| Germany | 27,878 | 18,834 | 20,592 |
| Netherlands | 15,343 | 16,430 | 16,560 |

| | | | |
|---|---|---|---|
| **Others** | 122,356 | 88,665 | 91,278 |

Source: CBI Center for Promotion of Exports from Developing Countries, Netherlands 1995.

### 11.2.3 France

The overall French market for medical technology, including all kind of medical and surgical instruments and equipment, is estimated to be around US $ 4.5 billion. The French market is 5% of the total world medical technology market and 20% of the total European market. The sector comprises some 250 firms employing more than 20,000 people. The top ten firms in the medical technology sector comprise of subsidiaries of major international conglomerates such as Johnson & Johnson, Baxter, Siemens, etc, which account for 30% of the total sales of the sector. Most of the French companies in the sector are SMEs, with an employment of 50 persons. These companies mostly cater to the demand of local French market.

**France Surgical Instrument Imports US $ 000**

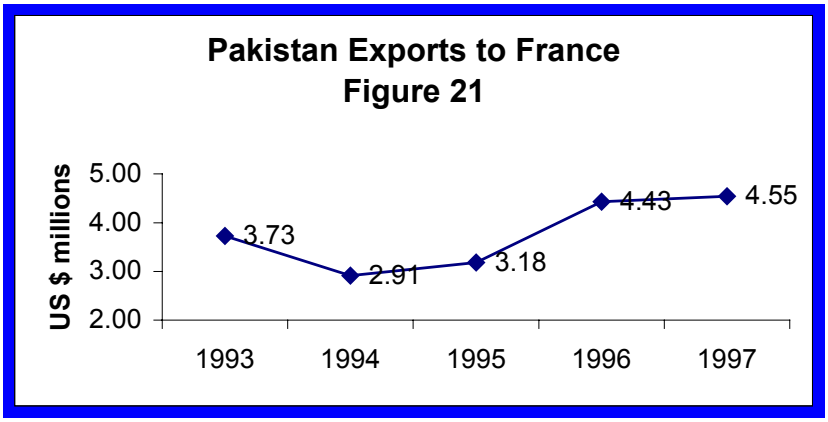
**Table 11**

| | 1992 | 1993 | 1994 |
|---|---|---|---|
| USA | 90,894 | 125,608 | 120,205 |
| Germany | 55,176 | 53,110 | 40,849 |
| United Kingdom | 15,675 | 30,718 | 36,008 |
| **Others** | 181,032 | 167,686 | 136,165 |

Source: CBI Center for Promotion of Exports from Developing Countries, Netherlands 1995.

Around 50% of the total demand for medical technology instruments in France is met through imports from various countries. The surgical instruments market is comparatively a small part of the total medical equipment sector. During 1997, France imported US $ 797 million worth of surgical instruments. The figure is based on 87229 (representing a broader category). Further detailed country wise imports of France can also be observed in the Annexure A. Data

breakdown to obtain the exact share of surgical instrument in the broader category is not available. Considering the past trend of French surgical instruments imports, as mentioned in the table 11, where in 1994 France imported US $ 333 million worth of surgical instruments. It can be safely assumed out of the total imports of US $ 797 million during 1997, the actual share of surgical instruments is not less than US $ 400 million.



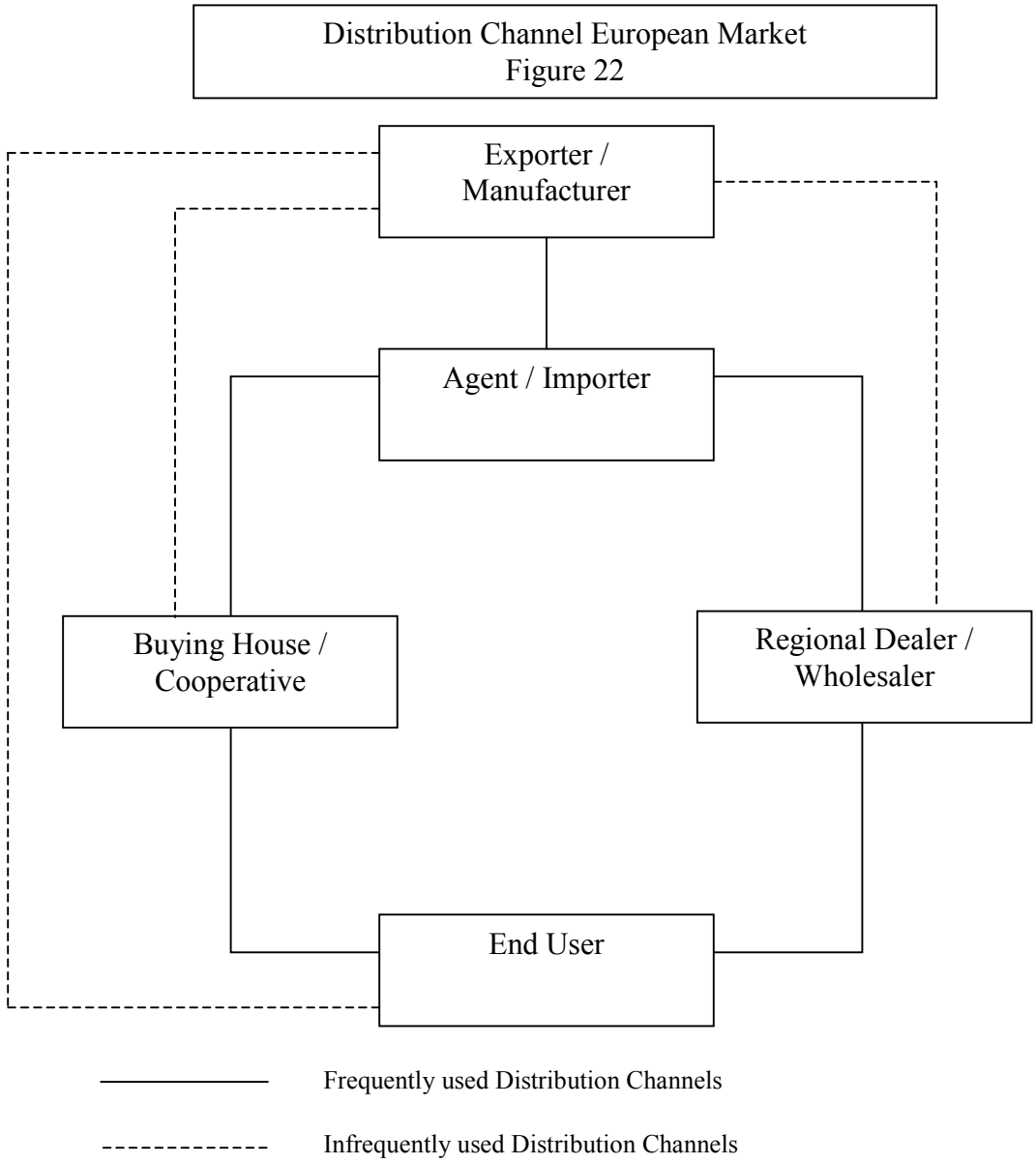

France is the fourth largest importer of Pakistani surgical instruments. As can be seen in the figure around US $ 4.5 million worth of surgical instruments were exported to France. Over a period of five years the Dollar value of export has grown at an average rate of 13%. France, like the United Kingdom, is an important market for the O.R grade instruments. In 1997, France imported 2.6 million units of O.R grade instruments from Pakistan equaling to a 3% share of the total volume surgical instruments exported.

### 11.2.4 Distribution Channel and Other European Countries

There are some other countries of Europe which import surgical instruments from Pakistan but only a few are discussed in detail, keeping in view the market size and in particular the demand for Pakistan made surgical instruments. Other European countries which import Pakistani instruments include, Netherlands, Italy, Switzerland, Denmark, etc. The imports and exports of

surgical and medical instruments, top fifteen exporting countries, based on time series data of five years can be observed in Annexure A.

The medical and surgical instruments can be sold in the European market through varied distribution channels. The manufacturers can sell their products to wholesalers/regional dealers, buying cooperatives and also the end user (hospitals and general practitioners). Direct distribution to the end user is uncommon due to large network requirement. Mostly transnational companies operate in this manner, which can afford to invest in such a distribution system. In most of the cases the importers/agents with specific market know-how and expertise bridge the gap between the producers and end-users through regional dealers/wholesalers. The instruments exported from Pakistan usually use the above mentioned distribution channel. The foremost problem to cater to the end user is the absence of brand names and the small size of entities in the local production of surgical instruments, which makes it impossible for them to establish such wide marketing and distribution networks. The distribution channel for surgical instruments in the European market is shown in figure 22.




## 12 Marketing of Surgical Instruments

Due to the absence of established brand names within the industry and also inactive involvement of world-renowned brand names, manufacturers have to use different marketing techniques to introduce themselves and their products globally.

### 12.1 Representative Offices

Very few surgical instrument manufacturing companies, from the high sales segment, have their representative offices in other countries. Most of these companies are involved in manufacturing OR instruments. The representative offices are incorporated in the country in which they are located. Such set up of local companies are located in United Kingdom only. This enables the local manufacturers to have better understanding about the market dynamics and regulation of the country and is also helpful in directly participating in bidding process to cater to the end user. Strategically it also increases the competitive advantage over others in approaching markets of different European countries.

### 12.2 Personal Visits

Personal visits are the most frequently used medium of marketing surgical instruments. Almost all the exporters personally visit foreign markets along with their samples. Since Germany is world biggest market for OR instruments, the manufacturers from Pakistan visit Germany more often than any other country. Through personal visits they are able to get orders and introduce their new products. Quite a number of surgical instrument manufacturers have long term relationship of trust with their buyers in foreign countries which is enables them to operate effectively even without frequently visiting the buyers.

### 12.3 Trade Fairs

The success of an industry such as the surgical instruments depends upon continuos innovation and effective marketing of its products. In modern times trade fairs provide an excellent platform to introduce ones products. Germany again has established a reputation of holding large trade fairs for different industrial sectors and medical and surgical instrument is also one of those. Each year trade fairs are organised in different places, where medical and surgical instrument manufacturers, distributors and dealers from all over the world exhibit their products. The Pakistani exporters from high and medium sales segment, due to availability of resources, can ensure their participation in such trade fairs but the low sales segment is unable to access potential buyers from different markets through this medium.

### 12.4 Other Methods of Marketing

Other form of marketing include approaching the buyers through telephone and faxes and also through mailing the company profile to organisations associated with the surgical instrument trade. All the manufacturers have made catalogs giving detailed description of their products and prices. The exporters from high and medium sales segment are also more active than the small sales segment in marketing their products through these methods.

## 13 Pricing of Surgical Instruments

The prices of Pakistani surgical instruments, when compared in a global market, are placed at the lower end of the market. The foremost reason is the absence of established brand names in the industry. The manufacturers in the developed countries are able to fetch better prices for their products because most of them manufacture under registered brand names and have also established transnational distribution network of their own. Although there are a couple of joint ventures operating in Sialkot but their number is too small given the wide scale presence of manufacturing units.

**Price Comparisons of Simple Surgical Instruments**

**Table 12**

| Description | Pakistan Disposable Instruments US $ / Unit | Pakistan OR Instruments US $ / Unit | German Instruments US $ / Unit |
|---|---|---|---|
| Mosquito Forceps 5" Straight or Curved | 0.39 - 0.49 | 2.00 - 2.25 | 10.00 - 12.00 |

| | | | |
|---|---|---|---|
| Kelly Forceps 5 ½/" Straight or Curved | 0.45 - 0.54 | 2.00 - 2.25 | 10.00 - 12.00 |
| Webster Needle Holder 5" | 0.47 - 0.57 | 2.10 - 2.35 | 13.00 - 15.00 |
| Iris Scissors 4 ½" Straight or Curved | 0.29 - 0.35 | 1.30 - 1.50 | 4.00 - 6.00 |
| Stitch Scissors 4 ½" | 0.35 - 0.42 | 1.40 - 1.60 | 5.00 - 7.00 |
| Operating Scissors 5 ½" S/B or S/S | 0.48 - 0.53 | 2.10 - 2.40 | 8.00 - 10.00 |
| Adson Dressing Forceps 4 ¾" Serrated | 0.21 - 0.25 | 1.20 - 1.40 | 4.00 - 5.00 |
| Adson Tissue Forceps 4 ¾" 1x2 Teeth | 0.22 - 0.26 | 1.30 - 1.50 | 4.00 - 5.00 |
| Thumb Dressing Forceps 5" Serrated | 0.25 - 0.29 | 1.00 - 1.20 | 3.00 - 4.00 |
| Iris Forceps 4 ¼" 1x2 Teeth Straight | 0.28 - 0.32 | 1.60 - 1.90 | 4.00 - 5.00 |

### 13.1 Price Comparisons

The Table 12 presents price comparisons of some of the simple surgical instruments. The instruments are classified in three different categories, the disposable instruments, OR instruments and the German instruments. One thing can be concluded from the Table that the prices of German instruments are much higher as compared to that of locally manufactured ones. The German instruments may be priced four to five times higher than Pakistani instruments. If we analyse the more sophisticated class of instruments, and that too of established German branded products, then the price differences are further widened.

### 13.2 Re-export and Distribution Spreads

Another thing that is worth mentioning is the presence of enormous re-export margins in the surgical instrument trade. The Pakistani manufacturers are the 'discounters' in the global surgical instrument trade. Almost all the manufacturers have to rely on the international distributors/wholesalers for marketing and distribution of their products. These intermediaries re-export the products of Pakistani manufacturers at much higher prices. Similarly, as also mentioned previously, the German manufacturers send unfinished instruments forging to Pakistan, which are further processed and finished in Pakistan and again sent back to Germany where the manufacturers re-export them as branded products. The extent of re-export margins

varies from 100% to 2000%, depending on the type of surgical instrument. For a comparison of prices between locally manufactured instruments and the German branded products see exhibit 4.

# 14 Tax Structure for Surgical Instrument Industry

The Government of Pakistan, in order to facilitate export growth, has provided a number of incentives through fiscal concessions to the export oriented industries. A wide range of taxes is levied on the manufacturing industry, which in the case of export oriented are either reduced to a very low limit or waived.

## 14.1 Income Tax

As 95% of the total production of the surgical instrument industry is exported so the industry is exempt from income tax. The exporters, according to the Eighth Schedule of the income tax ordinance, pay only a token tax at the rate of 0.50%. The range of the token income tax varies from 0.50% to 1.00% depending on the level of value addition in the products. Since surgical instruments fall in the high value added segment, the exporters are liable to pay minimum of percentage of their income as tax.

## 14.2 Export Development Fund (EDF)

The export development fund contribution is made by every exporter at the rate of 0.25% of the total value of goods exported. This fund is collected with the purpose of further developing the exports from Pakistan. Mostly the resources from this fund are utilised for susidising export trade fairs, establishing technical centers for research and development, training seminars, and on a number of other projects and activities focussing on the development of exports oriented industries. Currently the fund is being managed by the Export Promotion Bureau.

## 14.3 Sales Tax

Sales tax has been levied on all the sectors at the rate of 15%. All the imported goods are also subject to sales tax at the same rate. The raw materials, stainless steel, grinding belts and wheels, etc are all imported by the manufacturers who have to pay sales tax on the imported goods. This sales tax in case the materials are used for the production of exportable products is refunded after the consignment has been shipped. The exporter in the concerned collectorate submits the sales tax refund, which after evaluation and assessment refund the sales tax amount.

### 14.4 Rebate

Rebate, in other words duty drawback, is the amount that is reimbursed by the government to the exporter as compensation for the duty paid by him on imported components used in manufacturing a product. The rate of rebate, to be paid on different products, is determined by the Ministry of Production and Industries. It calculates the amount of imported inputs used to manufacture a particular product and then fixes the rate of duty drawback.

The rebate is paid by the government as a percentage of the FOB value of exports. For surgical instruments, currently the rate of duty drawback has been fixed at 7.11% of FOB value. Besides improving the export performance of a sector, sometimes the unrealistic rebate rates have a negative impact on the industry. At one time the rebate on surgical instrument export was 25% which provided an incentive of over invoicing to the exporters, leading to huge contribution margins.

# 15 SWOT Analysis of Surgical Instrument Manufacturing in Pakistan

## 15.1 Strengths of Surgical Instrument Industry

### 15.1.1 Geographical Concentration

The surgical instrument industry of Pakistan is concentrated in the city of Sialkot and its peripheries. As the industry grew over the years the region surrounding Sialkot, within the radius of some twenty-five kilometers, also became an integral part of the surgical instrument industry structure. Concentration of surgical instrument manufacturers and sub contractors within a particular region is the biggest strength of the industry, which is depicted by the collective efficiency of the overall industry.

### 15.1.2 Economies of Scale

In the surgical instrument cluster a manufacturer carrying out various processes might not be able to reap the benefits of economies of scale. But wide scale process sub-contracting definitely generates economies of scale through processing of instruments in large volumes. As the number of instruments manufactured each year is more than 100 million units. Such large volumes in the presence of specialised sub-contractors has given Pakistan surgical industry a unique position and competitive advantage over other countries.

### 15.1.3 Availability of Inputs

The surgical instrument cluster, besides having large number of process sub-contractors also includes the suppliers, importers and traders of inputs such as stainless steel, chemicals and other raw materials. The presence of such input suppliers ensures the availability of raw materials therefore saving a lot of hassle for the manufacturers, which in absence of such suppliers have to import raw materials individually. This not only provides inputs at lower costs due to competition but also saves transportation and pre-operating costs (lead time).

### 15.1.4 Skilled Labour Force

The nature of processing in the surgical instrument industry is such that it is highly labour intensive and requires a high level of skill and precision. The total workforce of surgical instrument industry is between 45,000 - 50,000 which represents third or fourth generation of skilled workers. The art of manufacturing surgical instrument is transferred from one generation through another. A concentration of labour force, having the desired skill level, is another strength of the industry. It is for this reason that the industry has grown only in and around Sialkot. One manufacturing unit was set-up in Karachi, which was shut down due to high operational costs. The vendorisation in the industry also resolves the entrepreneurs' problem of labour force management.

### 15.1.5 Wide Spread Know How

The technical support required for the maintenance of machinery and equipment used by the surgical instrument industry is available within the industry cluster. The technicians have developed their understanding and skill to deal with any operational problems of the equipment.

### 15.1.6 Concentration on Core Competencies

Due to the industry norm of sub-contracting to process specialised vendors, the vendors carry out specific processes on large volumes of instruments therefore, developing their core competency in one or two processes. This has enabled the surgical instrument manufacturing to maintain homogenous quality of instruments to some extent along with economising on capital as well as labour.

### 15.1.7 Wide Product Range

Despite of limited resources and advance machines and equipment, the manufacturers are able to produce a diverse range of surgical and dental instruments. Without the use of sophisticated design and product development techniques the surgical instrument cluster has developed its capability of producing quality OR instruments comprising of more than 10,000 different instruments.

## 15.2 Weakness Of Surgical Instrument Industry

### 15.2.1 Minimal Involvement of Brand Names

Only a few established, world-renowned brand names are among the buyers of the industry. Most of the buyers are either the international distributors or whole salers. Dealing with such intermediaries' result in getting lower prices for locally manufactured products. Working with brand names not only means higher revenues but the brand names also assist the manufacturers in technological up-gradation, quality and management systems and skill development.

### 15.2.2 Branding

Another weakness of the industry is the absence of local brand names. The industry has a history of more than six decades and there are still no brand names. Only a few companies have tried to market their products with local brand names in the Middle East market and the United Kingdom with a limited success. The absence of local brand names deprives the industry of directly participating in tender business to cater to the end user in foreign markets and works adversely by giving the buyer (intermediary) greater bargaining power. Through development of local brand names the surgical instrument industry is likely to get access in the markets of less developed countries, which can ultimately prove to be a stepping stone to enter the markets of developed countries, with locally branded surgical instruments.

### 15.2.3 Marketing and Distribution

In the absence of brand names, the local surgical instrument industry is unable to place its products as a premium quality item. Even though the industry manufactures quality products comparable to any other manufacturer of the developed country. Due to insufficient marketing effort on the part of manufacturers, the prices of Pakistani instruments are at the lower end of the global surgical instrument market. Some of the instruments manufactured in Pakistan are sold at a much higher value for the single reason that they are stamped as "Made in Germany". Similarly the distribution of Pakistani instruments is carried out through international distributors and traders. No Pakistani company either has the resources or the expertise to set up a distribution

network of its own. The international intermediaries involved in the distribution of surgical instruments operate on large spreads.

### 15.2.4 Management

The surgical instrument manufacturing in Pakistan has been in the hands of two or three biradaris. Within this system one or two individuals manage an enterprise. This has resulted in the centralisation of authority and the success of the industry has further strengthened the entrepreneurs' belief that middle level management is not required to manage a business. The man at the top looks after the technical, financial, marketing and managerial needs of the organisation, and enjoys the sole decision making authority.

### 15.2.5 Technical Personnel and New Product Development

It is an astonishing fact that the surgical instrument manufacturing despite being engineering related highly technical industry, in Pakistan has developed without any technical support from engineers. There are hardly any engineers in the factories. The process supervision and operations management is done by non-technical personnel. The process of new product development is done by using reverse engineering, without following proper procedures such as preparing technical drawings. At this stage of development, to grow further the industry needs technical assistance in process improvement, operations management and also for new product development.

## 15.3 Opportunities for the Surgical Instrument Industry

### 15.3.1 Diversification

Technological innovation and surgical procedure development has become very common nowadays. The procedure, which used to be very complicated, has become very simple due to improvement in medical technology. The use of optic fiber and optical aid during surgery is a common practice. This has not only increased the success rate but has also modified the instruments required for surgical procedures. The Pakistani surgical instrument industry has maintained its focus only the on conventional surgical gadgets. The field of developing high

value surgical and orthopedic implants and electro-medical instruments has been completely ignored. The global market (value) of such instruments is greater than that of conventional surgical instruments. It is an excellent opportunity for the local industry to gear itself to take up development and production of instruments through latest materials such as plastics and other synthetics and also to explore the area of electro-medical and diagnostic instruments.

### 15.3.2 Manufacturing Flexibility

The nature of the processes in surgical instrument manufacturing provides an opportunity for the industry to produce a broad range of instruments. There are still certain high value added surgical instruments which, can be easily manufactured locally. The manufacturers also have the capability to modify the production processes by incurring very small capital expenditure.

### 15.3.3 Unexplored Markets

The Pakistani surgical instrument industry has traditionally exported products to selected regions. Major portion of the exports is destined to USA and Europe. The potential of some of the large markets such as Japan, Eastern Europe and CIS remains untapped. Japan, when observed in the broader category SITC 87229 and 87219, is the fourth largest importer of surgical, medical and dental instruments in the world. The total imports of Japan in the above mentioned categories during 1997 were more than US $ 841 millions.

### 15.3.4 Information Technology

The information super highway (Internet and email) has made it possible to access market information and learn about the latest development in the industry. No other method of marketing provides the kind of depth and penetration, which an organisation can achieve through the use of Internet. This provides a good opportunity to the local manufacturers of surgical instruments to market their products through web pages and the use of latest interactive computer tools such as discussion groups, news groups, etc. A number of American and European manufacturers have used Internet very effectively for marketing purpose. Almost all the big

brand names in the field of medical and surgical appliances have their web sites which provide information about the organisation, the product range and prices and their area of specialisation.

### 15.3.5 Joint Ventures

The surgical instrument cluster of Sialkot has established its reputation as a center of excellence in the South Asian region. Considering a long history of instrument manufacturing and the growth in exports (volume as well as value), the state of technology does not seem to be consistent with the industry growth. For under-developed countries collaboration with multi-national companies in a way facilitates the transfer of technology. This is also true for the surgical instrument cluster where the joint ventures with foreign companies have enabled the local partner to considerably up-grade technology. Currently there are only a couple of joint ventures in the industry. This is one area, which needs to be exploited to its full potential.

## 15.4 Threats to the Surgical Instrument Industry

### 15.4.1 Child Labour

The biggest threat to the surgical instrument industry is the involvement of child labour. 15% of total labour force of the surgical instrument industry comprises of child workers with an average age of 12.4 years. The labour department of the USA has taken very strict notice of the situation and have also given a deadline of October 1999 to eliminate child labour from the industry, otherwise a ban on imports from the industries involving child labour would be imposed. Such a ban would mean a loss of US $ 50 million only for the surgical instrument exports from Pakistan.

### 15.4.2 Upcoming Competition

The surgical instrument industry is highly labour intensive. The competitive advantage of Pakistan' s industry is the low wage rates. Within the past few years China, Mexico, Dominican Republic and some Eastern European nations, having the advantage of low wages, have also appeared on the global surgical instrument market as our competitors. The multi-national companies of USA have invested heavily in Mexico and Dominican Republic to set up their manufacturing facilities due to cheap labour availability. These countries, besides having the

advantage of cheap labour, are technologically superior in innovation and use of modern materials in manufacturing as compared to Pakistan.

### 15.4.3 Quality Systems

Although the surgical instrument industry, as a single sector, has the largest number of ISO and GMP certified companies, but still there are some companies who need to have ISO certification. Another issue, a step ahead of ISO quality systems, is the CE mark. Few years down the road it will become mandatory for the exporters to have CE mark on their products, in order to export their merchandise to European countries.

### 15.4.4 Latest Developments

The latest development in the field of medicine and surgery work both ways. They are threat to the industry, such as ours, which is unable to keep pace with the innovations and developments in the sector, and provide excellent opportunity for the entrepreneurs who adapt quickly to the changing trends and advancement to cater to a broader market. The Pakistani surgical instrument industry, in order to develop on sustainable basis needs to have a strong research and development base which facilitates the introduction of new materials and latest processing techniques.

# 16 SMEDA's Role in Surgical Instrument Industry Development

Taking the SMEDA template of sector research into consideration, which focuses on the analysis of a sector by taking into account all the vital aspects of it such as technology, finance, marketing and management, the single most important interventions to develop the surgical instrument industry on sustainable basis is marketing. This is one area in which the SMEs associated with the surgical instrument trade are lacking.

## 16.1 Why Not Technology?

There are certain processes, which are obsolete and need to be up-graded. But technological up-gradation should not be imposed at the cost of the industry's competitive advantage. The surgical instrument industry of Pakistan has been exporting all types of instruments for the past many years. Some of the instruments are also re-exported bearing brand names and stamps of other foreign countries at a high premium. This represents the acceptance of quality of the instruments produced in Pakistan. The only problem is the absence of established brand names and the lack of a concentrated image building effort on the part of the companies as well as the state.

## 16.2 What is Wrong with Marketing?

The firms associated with surgical instrument manufacturing have maintained a narrow focus in context of product range. The usage of latest materials and the development of high value added products have been ignored.

### 16.2.1 Traditional Markets

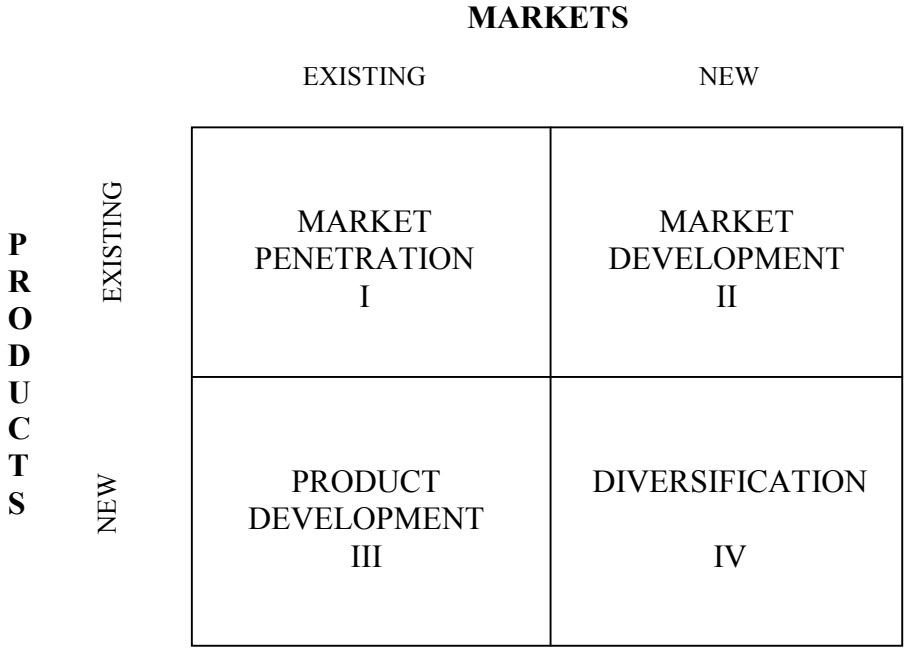
Generally the surgical instrument manufacturers of Sialkot have tried to increase their penetration in the existing markets such as Europe and America. One reason for this is the limited resources of these SMEs which find it easier to sell their products in the existing markets. Another benefit of targeting these markets is the awareness of the customers, who have enough knowledge about the Pakistani products which is again convenient for the exporter rather than developing a new market from scratch.

### 16.2.2 Traditional Products

The Pakistani surgical instrument manufacturing to some extent is a victim of BandWagon Effect. The growth in the number of manufacturing facilities is not consistent with the growth of product range. New product development is a phenomenon, which is rarely, witnessed. Such a situation has resulted in saturation of markets for Pakistani instruments and a cutthroat competition within the industry.

FIGURE 23

**ANSOFF COMPANY GROWTH MATRIX**




## 16.3 Company Growth Matrix Analysis

The Ansoff growth matrix assists in determining the existing state of the surgical instrument industry. It also enables to identify areas for future policy intervention.

### 16.3.1 Status of the Industry

Analytically viewing the current state of the industry, the product range and the importing countries, almost all the manufacturing units, regardless of their size, fall in the first quadrant of the matrix. Which reveals that the industry has only tried to increase their penetration further in

the existing markets without any innovation in the products, with only a few exceptions. The impact of such efforts when viewed in a broader spectrum of the industry is minimal.

## 16.4 Unexplored Avenues: Areas of Future Growth

### 16.4.1 Existing Products New Markets

In order to achieve sustainable growth, the surgical instrument industry must explore the new markets for its existing products as mentioned in the second quadrant of the growth matrix. There also exist some success stories of the entrepreneurs who have ventured into new markets. Exploring new markets require accurate market intelligence based on the macro economic environment, competitors, stakeholders and the growth rates of the product in the foreign market. America is one market, which has traditionally imported disposable surgical instruments from Pakistan, while it imports the OR instruments from Germany and other countries. Similarly there are markets of existing products that remain unexplored.

### 16.4.2 New Products Existing Markets

As depicted by the third quadrant of the industry growth matrix, the existing markets should be targeted with better, improved and new products. Creating a niche for low priced new products can capture already saturated markets.

Similarly for the American market instead of providing simple instruments at low prices, which are then combined with other instruments and distributed as kits, the local industry should move one step ahead into local kit packing. In the first phase simple kits could be manufactured in collaboration with foreign partners and progressively the industry can go into the production of complex and sophisticated kits.

### 16.4.3 New Markets and Diversification

Diversification has already been stressed in earlier sections of the report. The success of large multinational organisations, in medical and surgical instrument trade, lies in the fact that they provide complete solution to the end user. The diversification in the product range secures a

greater market share in the global trade for them. It would be simply not possible for the SMEs of Sialkot to diversify on the pattern of multi nationals. But at a smaller level, diversification into allied products using different raw materials can definitely be achieved. Areas such as orthopedic and surgical implants, electro-medical devices, etc still remain untapped by the local industrialists.

## 16.5 SMEDA's Pro-Active Involvement

### 16.5.1 Hub of Information Dissemination

An important aspect of enhancing exports is the availability of market information. The principal gap in terms of SME information needs relates to intra country flow of information. Most of the times the information is available but it is not conveyed to the industry. The American Department of Commerce started such a programme of trade promotion in the late 1960's. The purpose of the programme was to provide information to the local business community regarding foreign market opportunities, intermediaries and trade leads. SMEDA can play a similar role with increased coordination among the commercial trade offices, EPB, Ministry of Commerce and other concerned departments.

### 16.5.2 Switch to High Value Added Products

The strategy development needs to be observed in further detail so as to evaluate the viability of manufacturing complete procedure kits in Pakistan. Even if it turns out to be commercially viable, it will still require marketing input. Because it would not be possible for local manufacturers to market these kits with their own brand names. Collaborating with some established American kit packer is likely to facilitate the local industry in indirectly approaching the end user through a complete solution (procedure kits).

### 16.5.3 Export Trade Companies

The intermediaries involved in the surgical instrument trade make a great deal of money just because the local manufacturers, due to limited resources, are unable to have their own distribution networks. In many countries export trade companies have solved the problem of

marketing for the SMEs. An export company invests in building up its databases containing information on different markets, products, latest trends, key players involved, etc. Export Trade Company in other words simply means access to vast networks and managerial resources without going through the astronomical expense of setting up such resources by itself. The success of the SME revolution in Japan owes much to the contribution of export trade houses "Sogo Shosha". This concept was successfully replicated in the economies of Pacific Rim. India has also formulated a policy for the establishment of export houses specialising in international marketing. The concept of establishing export trade companies in Pakistan also requires further research by taking into account the development stage, export potential and the willingness of the SMEs to export.

### 16.5.4 Joint Ventures

Technological development and process improvement play a vital role in providing an impetus to the industry for continuos up-gradation of products and innovation with the added benefits of buy-back arrangements. The local surgical instrument manufacturing SMEs due to their size are unable to equip themselves with the latest production techniques. Collaboration with foreign companies provides excellent opportunities to transfer expensive technology. Working with foreign companies also enhances the management capabilities of the local partners that are able to target potential markets effectively. Considering the size of the surgical instrument manufacturing cluster in Pakistan, the number of joint ventures is too low. This another area which needs to be explored in a structured and well-organised manner.

**Exhibit 1**
**Standard Industrial Trade Classification (SITC)**
**Medical, Surgical and Dental Instruments**

| SITC (five digit) | SITC (seven digit) | Description |
|---|---|---|
| 87229 Other Instruments and Appliances | 8722901 | Anesthesia Apparatus |
| | 8722902 | Stethoscope |
| | 8722903 | Surgical Needles |
| | 8722904 | Surgical Scissors |
| | 8722905 | Surgical Knives |
| | 8722906 | Sphygmomanometers |
| | 8722909 | Surgical Instruments, n. s. |
| | 8722919 | Medical Instruments and Appliances, Non-electric, n. s. |
| | | |
| 87219 Other Dental Instruments and Appliances | 8721900 | Other Dental Instruments & Appliances |

# ANNEXURE 1.1

## SITC 87219 & 87229
## Value in $'000'
## World Imports

| | | 1993 | | 1994 | | 1995 | | 1996 | | 1997 | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Country** | **Unit** | **Value** | **Quantity** | **Value** | **Quantity** | **Value** | **Quantity** | **Value** | **Quantity** | **Value** | **Quantity** |
| **TOTAL WORLD** | **R** | **8,604,534** | **0** | **9,389,778** | **0** | **10,744,443** | **0** | **11,809,646** | **0** | **10,808,318** | **0** |
| | | | | | | | | | | | |
| USA,PR,USVI | | 1,599,356 | 0 | 1,577,256 | 0 | 1,795,982 | 0 | 1,917,260 | 0 | 1,980,128 | 0 |
| | | 18.59% | | 16.80% | | 16.72% | | 16.23% | | 18.32% | |
| GERMANY | W | 839,219 | 10,961 | 912,845 | 11,611 | 1,087,659 | 15,030 | 1,174,446 | 17,047 | 1,077,865 | 18,717 |
| | | 9.75% | | 9.72% | | 10.12% | | 9.94% | | 9.97% | |
| FRANCE | W | 690,850 | 12,599 | 716,538 | 10,910 | 833,938 | 12,752 | 884,735 | 14,045 | 879,891 | 12,557 |
| | | 8.03% | | 7.63% | | 7.76% | | 7.49% | | 8.14% | |
| JAPAN | W | 542,630 | 4,561 | 635,873 | 5,007 | 816,727 | 5,800 | 847,833 | 7,305 | 841,158 | 8,317 |
| | | 6.31% | | 6.77% | | 7.60% | | 7.18% | | 7.78% | |
| ITALY | W | 562,024 | 7,151 | 580,628 | 8,566 | 636,708 | 9,274 | 688,653 | 9,671 | 691,473 | 10,423 |
| | | 6.53% | | 6.18% | | 5.93% | | 5.83% | | 6.40% | |
| UNTD KINGDOM | W | 487,434 | 16,708 | 552,604 | 13,579 | 595,477 | 16,120 | 610,679 | 15,617 | 694,784 | 17,586 |
| | | 5.66% | | 5.89% | | 5.54% | | 5.17% | | 6.43% | |
| BELGIUM-LUX | W | 278,226 | 5,723 | 328,751 | 8,136 | 418,493 | 8,587 | 477,902 | 8,987 | 469,363 | 11,264 |
| | | 3.23% | | 3.50% | | 3.89% | | 4.05% | | 4.34% | |
| NETHERLANDS | W | 297,307 | 4,498 | 320,367 | 5,065 | 371,407 | 5,021 | 431,606 | 6,119 | 405,205 | 8,049 |
| | | 3.46% | | 3.41% | | 3.46% | | 3.65% | | 3.75% | |
| CANADA | | 305,398 | 0 | 313,187 | 0 | 329,090 | 0 | 326,094 | 0 | 382,172 | 0 |
| | | 3.55% | | 3.34% | | 3.06% | | 2.76% | | 3.54% | |
| SPAIN | W | 292,461 | 7,366 | 306,377 | 7,795 | 343,717 | 8,248 | 380,500 | 7,232 | 0 | 0 |
| | | 3.40% | | 3.26% | | 3.20% | | 3.22% | | 0.00% | |
| AUSTRALIA | | 166,460 | 0 | 204,870 | 0 | 213,243 | 0 | 246,334 | 0 | 275,207 | 0 |
| | | 1.93% | | 2.18% | | 1.98% | | 2.09% | | 2.55% | |
| SWITZ.LIECHT | W | 166,350 | 1,843 | 192,385 | 2,038 | 212,981 | 2,044 | 223,571 | 2,085 | 212,940 | 2,118 |
| | | 1.93% | | 2.05% | | 1.98% | | 1.89% | | 1.97% | |
| SWEDEN | W | 152,646 | 3,239 | 185,014 | 3,179 | 204,830 | 3,006 | 214,680 | 3,250 | 201,587 | 3,184 |
| | | 1.77% | | 1.97% | | 1.91% | | 1.82% | | 1.87% | |
| AUSTRIA | W | 181,407 | 2,566 | 197,167 | 2,740 | 193,336 | 3,761 | 210,973 | 3,585 | 0 | 0 |
| | | 2.11% | | 2.10% | | 1.80% | | 1.79% | | 0.00% | |
| SINGAPORE | | 111,806 | 0 | 156,494 | 0 | 159,950 | 0 | 163,444 | 0 | 161,496 | 0 |
| | | 1.30% | | 1.67% | | 1.49% | | 1.38% | | 1.49% | |

**Source: ITC Database PCTAS 1998. (W: Weight in Metric Tonnes, N: Number of Units, R: Rupture of Units) Percentage (%): % share in trade**

# ANNEXURE 1.2

## SITC 87219 & 87229
## Value in $'000'
## World Exports

| | | 1993 | | 1994 | | 1995 | | 1996 | | 1997 | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Country | Unit | Value | Quantity | Value | Quantity | Value | Quantity | Value | Quantity | Value | Quantity |
| **TOTAL WORLD** | **R** | **8,391,018** | **0** | **8,937,993** | **0** | **9,982,222** | **0** | **10,899,346** | **0** | **11,658,220** | **0** |
| | | | | | | | | | | | |
| USA,PR,USVI | | 1,954,289 | 0 | 2,137,932 | 0 | 2,309,719 | 0 | 2,740,438 | 0 | 3,156,033 | 0 |
| | | 23.29% | | 23.92% | | 23.14% | | 25.14% | | 27.07% | |
| GERMANY | W | 1,604,022 | 12,342 | 1,636,613 | 12,976 | 1,823,233 | 14,315 | 1,832,613 | 17,072 | 1,767,217 | 18,208 |
| | | 19.12% | | 18.31% | | 18.26% | | 16.81% | | 15.16% | |
| JAPAN | W | 919,121 | 11,541 | 887,510 | 11,584 | 898,492 | 11,109 | 848,331 | 11,597 | 930,945 | 12,881 |
| | | 10.95% | | 9.93% | | 9.00% | | 7.78% | | 7.99% | |
| UNTD KINGDOM | W | 500,353 | 15,228 | 597,570 | 122,208 | 693,008 | 18,347 | 788,309 | 23,780 | 872,104 | 23,179 |
| | | 5.96% | | 6.69% | | 6.94% | | 7.23% | | 7.48% | |
| FRANCE | W | 454,256 | 7,466 | 488,653 | 8,391 | 526,840 | 8,886 | 538,800 | 8,312 | 545,394 | 9,755 |
| | | 5.41% | | 5.47% | | 5.28% | | 4.94% | | 4.68% | |
| ITALY | W | 348,816 | 11,504 | 366,150 | 13,427 | 434,918 | 14,378 | 472,336 | 15,411 | 453,268 | 16,354 |
| | | 4.16% | | 4.10% | | 4.36% | | 4.33% | | 3.89% | |
| SWITZ.LIECHT | W | 315,194 | 1,812 | 359,049 | 1,938 | 421,463 | 1,876 | 446,288 | 2,049 | 443,092 | 2,283 |
| | | 3.76% | | 4.02% | | 4.22% | | 4.09% | | 3.80% | |
| NETHERLANDS | W | 352,948 | 6,004 | 332,628 | 5,300 | 337,303 | 4,541 | 401,650 | 5,968 | 460,860 | 6,861 |
| | | 4.21% | | 3.72% | | 3.38% | | 3.69% | | 3.95% | |
| BELGIUM-LUX | W | 242,016 | 5,773 | 263,270 | 6,411 | 367,510 | 8,106 | 375,284 | 7,048 | 387,770 | 8,527 |
| | | 2.88% | | 2.95% | | 3.68% | | 3.44% | | 3.33% | |
| SINGAPORE | | 275,492 | 0 | 301,232 | 0 | 305,104 | 0 | 315,961 | 0 | 365,997 | 0 |
| | | 3.28% | | 3.37% | | 3.06% | | 2.90% | | 3.14% | |
| SWEDEN | W | 233,681 | 8,674 | 256,450 | 5,888 | 298,422 | 5,722 | 354,464 | 6,175 | 359,868 | 6,022 |
| | | 2.78% | | 2.87% | | 2.99% | | 3.25% | | 3.09% | |
| IRELAND | W | 231,862 | 4,579 | 202,429 | 3,838 | 235,405 | 3,549 | 267,374 | 4,899 | 307,334 | 5,598 |
| | | 2.76% | | 2.26% | | 2.36% | | 2.45% | | 2.64% | |
| MEXICO | W | 194,276 | 17,707 | 180,632 | 6,734 | 196,890 | 17,321 | 256,828 | 25,849 | 369,614 | 17,973 |
| | | 2.32% | | 2.02% | | 1.97% | | 2.36% | | 3.17% | |
| ISRAEL | | 76,720 | 0 | 97,190 | 0 | 119,883 | 0 | 165,680 | 0 | 234,976 | 0 |
| | | 0.91% | | 1.09% | | 1.20% | | 1.52% | | 2.02% | |
| PAKISTAN | N | 105,723 | 81,834,240 | 96,847 | 67,186,504 | 110,211 | 76,896,480 | 137,593 | 94,050,392 | 134,117 | 97,806,120 |
| | | 1.26% | | 1.08% | | 1.10% | | 1.26% | | 1.15% | |

**Source: ITC Database PCTAS 1998. (W: Weight in Metric Tonnes, N: Number of Units, R: Rupture of Units) Percentage (%): % share in trade**

# ANNEXURE 1.3

## SITC 87229
## Value in $'000'
## World Imports

| | | 1993 | | 1994 | | 1995 | | 1996 | | 1997 | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Country** | **Unit** | **Value** | **Quantity** | **Value** | **Quantity** | **Value** | **Quantity** | **Value** | **Quantity** | **Value** | **Quantity** |
| **TOTAL WORLD** | **R** | **7,703,215** | **0** | **8,396,171** | **0** | **9,680,942** | **0** | **10,601,323** | **0** | **9,758,326** | **0** |
| | | | | | | | | | | | |
| USA,PR,USVI | | 1,457,357 | 0 | 1,450,483 | 0 | 1,649,017 | 0 | 1,755,439 | 0 | 1,804,242 | 0 |
| | | 18.92% | | 17.28% | | 17.03% | | 16.56% | | 18.49% | |
| GERMANY | W | 736,128 | 9,825 | 810,865 | 10,486 | 982,598 | 14,112 | 1,062,693 | 15,962 | 965,369 | 17,523 |
| | | 9.56% | | 9.66% | | 10.15% | | 10.02% | | 9.89% | |
| FRANCE | W | 617,548 | 11,020 | 638,643 | 9,557 | 745,672 | 11,391 | 784,609 | 11,695 | 796,948 | 11,237 |
| | | 8.02% | | 7.61% | | 7.70% | | 7.40% | | 8.17% | |
| JAPAN | W | 480,485 | 4,312 | 555,894 | 4,626 | 729,917 | 5,395 | 747,063 | 6,744 | 743,133 | 7,735 |
| | | 6.24% | | 6.62% | | 7.54% | | 7.05% | | 7.62% | |
| ITALY | W | 503,583 | 6,548 | 515,764 | 8,022 | 567,440 | 8,759 | 616,495 | 9,072 | 618,825 | 9,827 |
| | | 6.54% | | 6.14% | | 5.86% | | 5.82% | | 6.34% | |
| UNTD KINGDOM | W | 453,627 | 16,216 | 512,785 | 12,979 | 561,589 | 15,566 | 571,614 | 14,999 | 650,599 | 15,768 |
| | | 5.89% | | 6.11% | | 5.80% | | 5.39% | | 6.67% | |
| BELGIUM-LUX | W | 258,680 | 5,400 | 309,572 | 7,819 | 400,149 | 8,181 | 457,273 | 8,713 | 451,410 | 10,963 |
| | | 3.36% | | 3.69% | | 4.13% | | 4.31% | | 4.63% | |
| NETHERLANDS | W | 273,871 | 4,231 | 293,116 | 4,832 | 344,691 | 4,840 | 401,614 | 5,784 | 381,924 | 7,307 |
| | | 3.56% | | 3.49% | | 3.56% | | 3.79% | | 3.91% | |
| CANADA | | 262,985 | 0 | 268,095 | 0 | 285,892 | 0 | 277,240 | 0 | 319,391 | 0 |
| | | 3.41% | | 3.19% | | 2.95% | | 2.62% | | 3.27% | |
| SPAIN | W | 265,488 | 6,833 | 270,009 | 7,156 | 301,869 | 7,560 | 335,680 | 6,403 | 0 | 0 |
| | | 3.45% | | 3.22% | | 3.12% | | 3.17% | | 0.00% | |
| AUSTRALIA | | 143,945 | 0 | 178,199 | 0 | 190,340 | 0 | 220,624 | 0 | 243,624 | 0 |
| | | 1.87% | | 2.12% | | 1.97% | | 2.08% | | 2.50% | |
| SWEDEN | W | 124,960 | 2,953 | 150,940 | 2,885 | 176,398 | 2,802 | 183,664 | 3,018 | 172,562 | 2,873 |
| | | 1.62% | | 1.80% | | 1.82% | | 1.73% | | 1.77% | |
| SWITZ.LIECHT | W | 123,564 | 1,418 | 144,321 | 1,610 | 166,711 | 1,673 | 174,455 | 1,726 | 167,953 | 1,763 |
| | | 1.60% | | 1.72% | | 1.72% | | 1.65% | | 1.72% | |
| IRELAND | W | 104,991 | 3,013 | 119,350 | 2,974 | 133,587 | 3,419 | 163,914 | 4,523 | 176,312 | 4,552 |
| | | 1.36% | | 1.42% | | 1.38% | | 1.55% | | 1.81% | |
| SINGAPORE | | 111,806 | 0 | 143,684 | 0 | 143,153 | 0 | 142,450 | 0 | 145,064 | 0 |
| | | 1.45% | | 1.71% | | 1.48% | | 1.34% | | 1.49% | |

**Source: ITC Database PCTAS 1998. (W: Weight in Metric Tonnes, N: Number of Units, R: Rupture of Units) Percentage (%): % share in trade**

# ANNEXURE 1.4

## SITC 87229
## Value in $'000'
## World Exports

| | | 1993 | | 1994 | | 1995 | | 1996 | | 1997 | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Country** | **Unit** | **Value** | **Quantity** | **Value** | **Quantity** | **Value** | **Quantity** | **Value** | **Quantity** | **Value** | **Quantity** |
| **TOTAL WORLD** | **R** | **7,299,226** | **0** | **7,779,351** | **0** | **8,799,988** | **0** | **9,692,731** | **0** | **10,545,851** | **0** |
| | | | | | | | | | | | |
| USA,PR,USVI | | 1,678,372 | 0 | 1,867,013 | 0 | 2,003,684 | 0 | 2,396,080 | 0 | 2,844,978 | 0 |
| | | 22.99% | | 24.00% | | 22.77% | | 24.72% | | 26.98% | |
| GERMANY | W | 1,269,675 | 10,391 | 1,272,133 | 11,117 | 1,547,628 | 13,086 | 1,589,018 | 15,917 | 1,543,548 | 17,006 |
| | | 17.39% | | 16.35% | | 17.59% | | 16.39% | | 14.64% | |
| JAPAN | W | 838,501 | 10,715 | 820,951 | 10,966 | 826,611 | 10,354 | 782,103 | 10,915 | 852,417 | 11,998 |
| | | 11.49% | | 10.55% | | 9.39% | | 8.07% | | 8.08% | |
| UNTD KINGDOM | W | 488,689 | 15,034 | 585,869 | 15,924 | 680,526 | 18,116 | 771,470 | 23,253 | 851,344 | 22,812 |
| | | 6.70% | | 7.53% | | 7.73% | | 7.96% | | 8.07% | |
| FRANCE | W | 413,736 | 6,568 | 441,693 | 7,875 | 479,339 | 8,312 | 490,587 | 7,956 | 502,088 | 9,369 |
| | | 5.67% | | 5.68% | | 5.45% | | 5.06% | | 4.76% | |
| NETHERLANDS | W | 339,817 | 5,542 | 318,664 | 5,070 | 328,766 | 4,373 | 392,150 | 5,627 | 451,616 | 6,543 |
| | | 4.66% | | 4.10% | | 3.74% | | 4.05% | | 4.28% | |
| ITALY | W | 286,202 | 9,762 | 300,109 | 11,576 | 365,253 | 12,507 | 396,360 | 13,571 | 375,553 | 14,279 |
| | | 3.92% | | 3.86% | | 4.15% | | 4.09% | | 3.56% | |
| BELGIUM-LUX | W | 238,160 | 5,724 | 259,230 | 6,380 | 362,983 | 7,687 | 370,063 | 7,010 | 383,812 | 8,499 |
| | | 3.26% | | 3.33% | | 4.12% | | 3.82% | | 3.64% | |
| SINGAPORE | | 275,492 | 0 | 291,558 | 0 | 295,135 | 0 | 307,384 | 0 | 356,972 | 0 |
| | | 3.77% | | 3.75% | | 3.35% | | 3.17% | | 3.38% | |
| SWEDEN | W | 210,034 | 7,555 | 228,068 | 4,662 | 263,917 | 4,288 | 316,118 | 5,047 | 324,517 | 4,863 |
| | | 2.88% | | 2.93% | | 3.00% | | 3.26% | | 3.08% | |
| IRELAND | W | 231,794 | 4,577 | 201,561 | 3,824 | 234,410 | 3,535 | 267,211 | 4,897 | 306,799 | 5,593 |
| | | 3.18% | | 2.59% | | 2.66% | | 2.76% | | 2.91% | |
| SWITZ.LIECHT | W | 185,574 | 1,322 | 224,031 | 1,381 | 260,831 | 1,391 | 284,952 | 1,535 | 278,429 | 1,782 |
| | | 2.54% | | 2.88% | | 2.96% | | 2.94% | | 2.64% | |
| MEXICO | W | 185,198 | 17,612 | 170,983 | 6,468 | 184,234 | 15,990 | 238,733 | 25,714 | 355,599 | 17,819 |
| | | 2.54% | | 2.20% | | 2.09% | | 2.46% | | 3.37% | |
| ISRAEL | | 74,256 | 0 | 93,641 | 0 | 117,409 | 0 | 162,310 | 0 | 231,630 | 0 |
| | | 1.02% | | 1.20% | | 1.33% | | 1.67% | | 2.20% | |
| PAKISTAN | N | 101,972 | 80,102,192 | 94,029 | 65,575,824 | 108,102 | 75,750,672 | 135,374 | 92,798,224 | 131,409 | 96,117,552 |
| | | 1.40% | | 1.21% | | 1.23% | | 1.40% | | 1.25% | |

**Source: ITC Database PCTAS 1998. (W: Weight in Metric Tonnes, N: Number of Units, R: Rupture of Units) Percentage (%): % share in trade**

# ANNEXURE 1.5

## SITC 87229
## Value in $'000'
## USA Imports

| | | 1993 | | 1994 | | 1995 | | 1996 | | 1997 | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Country | Unit | Value | Quantity | Value | Quantity | Value | Quantity | Value | Quantity | Value | Quantity |
| **TOTAL WORLD** | | **1,457,357** | **0** | **1,450,483** | **0** | **1,649,017** | **0** | **1,755,439** | **0** | **1,804,242** | **0** |
| | | | | | | | | | | | |
| GERMANY | | 320,831 | 0 | 289,786 | 0 | 316,107 | 0 | 305,400 | 0 | 290,702 | 0 |
| | | 22.01% | #DIV/0! | 19.98% | #DIV/0! | 19.17% | #DIV/0! | 17.40% | #DIV/0! | 16.11% | #DIV/0! |
| MEXICO | | 216,325 | 0 | 233,045 | 0 | 246,966 | 0 | 285,138 | 0 | 330,595 | 0 |
| | | 14.84% | #DIV/0! | 16.07% | #DIV/0! | 14.98% | #DIV/0! | 16.24% | #DIV/0! | 18.32% | #DIV/0! |
| DOMINICAN RP | | 135,815 | 0 | 159,517 | 0 | 279,863 | 0 | 296,571 | 0 | 301,454 | 0 |
| | | 9.32% | #DIV/0! | 11.00% | #DIV/0! | 16.97% | #DIV/0! | 16.89% | #DIV/0! | 16.71% | #DIV/0! |
| JAPAN | | 237,037 | 0 | 228,939 | 0 | 168,327 | 0 | 147,516 | 0 | 144,409 | 0 |
| | | 16.26% | #DIV/0! | 15.78% | #DIV/0! | 10.21% | #DIV/0! | 8.40% | #DIV/0! | 8.00% | #DIV/0! |
| SINGAPORE | | 170,373 | 0 | 183,783 | 0 | 220,680 | 0 | 177,645 | 0 | 157,444 | 0 |
| | | 11.69% | #DIV/0! | 12.67% | #DIV/0! | 13.38% | #DIV/0! | 10.12% | #DIV/0! | 8.73% | #DIV/0! |
| UNTD KINGDOM | | 88,046 | 0 | 40,300 | 0 | 64,976 | 0 | 75,893 | 0 | 58,623 | 0 |
| | | 6.04% | #DIV/0! | 2.78% | #DIV/0! | 3.94% | #DIV/0! | 4.32% | #DIV/0! | 3.25% | #DIV/0! |
| CHINA | | 18,269 | 0 | 28,473 | 0 | 50,686 | 0 | 97,658 | 0 | 116,431 | 0 |
| | | 1.25% | #DIV/0! | 1.96% | #DIV/0! | 3.07% | #DIV/0! | 5.56% | #DIV/0! | 6.45% | #DIV/0! |
| ISRAEL | | 18,295 | 0 | 25,254 | 0 | 32,047 | 0 | 46,785 | 0 | 58,757 | 0 |
| | | 1.26% | #DIV/0! | 1.74% | #DIV/0! | 1.94% | #DIV/0! | 2.67% | #DIV/0! | 3.26% | #DIV/0! |
| THAILAND | | 24,785 | 0 | 35,642 | 0 | 30,139 | 0 | 39,043 | 0 | 39,751 | 0 |
| | | 1.70% | #DIV/0! | 2.46% | #DIV/0! | 1.83% | #DIV/0! | 2.22% | #DIV/0! | 2.20% | #DIV/0! |
| SWITZ.LIECHT | | 27,028 | 0 | 30,760 | 0 | 28,966 | 0 | 37,013 | 0 | 36,519 | 0 |
| | | 1.85% | #DIV/0! | 2.12% | #DIV/0! | 1.76% | #DIV/0! | 2.11% | #DIV/0! | 2.02% | #DIV/0! |
| PAKISTAN | | 39,594 | 0 | 27,847 | 0 | 29,937 | 0 | 24,736 | 0 | 22,927 | 0 |
| | | 2.72% | #DIV/0! | 1.92% | #DIV/0! | 1.82% | #DIV/0! | 1.41% | #DIV/0! | 1.27% | #DIV/0! |
| COSTA RICA | | 6,504 | 0 | 22,301 | 0 | 26,274 | 0 | 36,708 | 0 | 46,273 | 0 |
| | | 0.45% | #DIV/0! | 1.54% | #DIV/0! | 1.59% | #DIV/0! | 2.09% | #DIV/0! | 2.56% | #DIV/0! |
| FINLAND | | 13,112 | 0 | 11,174 | 0 | 19,608 | 0 | 35,920 | 0 | 31,576 | 0 |
| | | 0.90% | #DIV/0! | 0.77% | #DIV/0! | 1.19% | #DIV/0! | 2.05% | #DIV/0! | 1.75% | #DIV/0! |
| CANADA | | 23,247 | 0 | 22,192 | 0 | 22,026 | 0 | 21,811 | 0 | 21,127 | 0 |
| | | 1.60% | #DIV/0! | 1.53% | #DIV/0! | 1.34% | #DIV/0! | 1.24% | #DIV/0! | 1.17% | #DIV/0! |
| FRANCE | | 19,271 | 0 | 18,506 | 0 | 12,625 | 0 | 25,063 | 0 | 28,604 | 0 |
| | | 1.32% | #DIV/0! | 1.28% | #DIV/0! | 0.77% | #DIV/0! | 1.43% | #DIV/0! | 1.59% | #DIV/0! |

**Source: ITC Database PCTAS 1998. (W: Weight in Metric Tonnes, N: Number of Units, R: Rupture of Units) Percentage (%): % share in trade**

# ANNEXURE 1.6

## SITC 87229
## Value in $'000'
## USA Exports

| | | 1993 | | 1994 | | 1995 | | 1996 | | 1997 | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Country | Unit | Value | Quantity | Value | Quantity | Value | Quantity | Value | Quantity | Value | Quantity |
| **TOTAL WORLD** | | **1,678,372** | **0** | **1,867,013** | **0** | **2,003,684** | **0** | **2,396,080** | **0** | **2,844,978** | **0** |
| | | | | | | | | | | | |
| JAPAN | | 235,844 | 0 | 282,877 | 0 | 396,679 | 0 | 405,668 | 0 | 459,348 | 0 |
| | | 14.05% | #DIV/0! | 15.15% | #DIV/0! | 19.80% | #DIV/0! | 16.93% | #DIV/0! | 16.15% | #DIV/0! |
| CANADA | | 197,610 | 0 | 199,658 | 0 | 211,256 | 0 | 200,343 | 0 | 226,538 | 0 |
| | | 11.77% | #DIV/0! | 10.69% | #DIV/0! | 10.54% | #DIV/0! | 8.36% | #DIV/0! | 7.96% | #DIV/0! |
| FRANCE | | 133,637 | 0 | 144,159 | 0 | 168,049 | 0 | 207,519 | 0 | 301,396 | 0 |
| | | 7.96% | #DIV/0! | 7.72% | #DIV/0! | 8.39% | #DIV/0! | 8.66% | #DIV/0! | 10.59% | #DIV/0! |
| GERMANY | | 154,819 | 0 | 169,640 | 0 | 164,178 | 0 | 196,608 | 0 | 226,418 | 0 |
| | | 9.22% | #DIV/0! | 9.09% | #DIV/0! | 8.19% | #DIV/0! | 8.21% | #DIV/0! | 7.96% | #DIV/0! |
| NETHERLANDS | | 109,491 | 0 | 136,071 | 0 | 157,122 | 0 | 194,904 | 0 | 218,897 | 0 |
| | | 6.52% | #DIV/0! | 7.29% | #DIV/0! | 7.84% | #DIV/0! | 8.13% | #DIV/0! | 7.69% | #DIV/0! |
| BELGIUM-LUX | | 134,658 | 0 | 143,094 | 0 | 112,938 | 0 | 115,693 | 0 | 155,289 | 0 |
| | | 8.02% | #DIV/0! | 7.66% | #DIV/0! | 5.64% | #DIV/0! | 4.83% | #DIV/0! | 5.46% | #DIV/0! |
| UNTD KINGDOM | | 95,853 | 0 | 99,329 | 0 | 117,960 | 0 | 137,961 | 0 | 153,449 | 0 |
| | | 5.71% | #DIV/0! | 5.32% | #DIV/0! | 5.89% | #DIV/0! | 5.76% | #DIV/0! | 5.39% | #DIV/0! |
| MEXICO | | 70,604 | 0 | 58,971 | 0 | 32,209 | 0 | 67,551 | 0 | 103,421 | 0 |
| | | 4.21% | #DIV/0! | 3.16% | #DIV/0! | 1.61% | #DIV/0! | 2.82% | #DIV/0! | 3.64% | #DIV/0! |
| ITALY | | 57,438 | 0 | 60,990 | 0 | 62,995 | 0 | 55,781 | 0 | 73,712 | 0 |
| | | 3.42% | #DIV/0! | 3.27% | #DIV/0! | 3.14% | #DIV/0! | 2.33% | #DIV/0! | 2.59% | #DIV/0! |
| AUSTRALIA | | 48,920 | 0 | 50,007 | 0 | 54,798 | 0 | 65,954 | 0 | 83,147 | 0 |
| | | 2.91% | #DIV/0! | 2.68% | #DIV/0! | 2.73% | #DIV/0! | 2.75% | #DIV/0! | 2.92% | #DIV/0! |
| DOMINICAN RP | | 6,960 | 0 | 12,658 | 0 | 16,581 | 0 | 108,256 | 0 | 91,763 | 0 |
| | | 0.41% | #DIV/0! | 0.68% | #DIV/0! | 0.83% | #DIV/0! | 4.52% | #DIV/0! | 3.23% | #DIV/0! |
| KOREA REP. | | 32,031 | 0 | 45,616 | 0 | 40,777 | 0 | 54,832 | 0 | 50,966 | 0 |
| | | 1.91% | #DIV/0! | 2.44% | #DIV/0! | 2.04% | #DIV/0! | 2.29% | #DIV/0! | 1.79% | #DIV/0! |
| OTH.ASIA NES | | 24,817 | 0 | 29,047 | 0 | 28,485 | 0 | 38,916 | 0 | 42,617 | 0 |
| | | 1.48% | #DIV/0! | 1.56% | #DIV/0! | 1.42% | #DIV/0! | 1.62% | #DIV/0! | 1.50% | #DIV/0! |
| SPAIN | | 35,423 | 0 | 35,373 | 0 | 35,272 | 0 | 32,087 | 0 | 25,294 | 0 |
| | | 2.11% | #DIV/0! | 1.89% | #DIV/0! | 1.76% | #DIV/0! | 1.34% | #DIV/0! | 0.89% | #DIV/0! |
| SWITZ.LIECHT | | 29,073 | 0 | 29,756 | 0 | 26,014 | 0 | 32,449 | 0 | 40,244 | 0 |
| | | 1.73% | #DIV/0! | 1.59% | #DIV/0! | 1.30% | #DIV/0! | 1.35% | #DIV/0! | 1.41% | #DIV/0! |

**Source: ITC Database PCTAS 1998. (W: Weight in Metric Tonnes, N: Number of Units, R: Rupture of Units) Percentage (%): % share in trade**

# ANNEXURE 1.7

## SITC 87229
## Value in $'000'
## Germany Imports

| | | 1993 | | 1994 | | 1995 | | 1996 | | 1997 | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Country** | **Unit** | **Value** | **Quantity** | **Value** | **Quantity** | **Value** | **Quantity** | **Value** | **Quantity** | **Value** | **Quantity** |
| **TOTAL WORLD** | **W** | **736,128** | **9,825** | **810,865** | **10,486** | **982,598** | **14,112** | **1,062,693** | **15,962** | **965,369** | **17,523** |
| | | | | | | | | | | | |
| USA,PR,USVI | W | 211,834 | 1,506 | 204,653 | 1,748 | 239,380 | 1,819 | 256,299 | 2,070 | 250,973 | 2,694 |
| | | 28.78% | 15.33% | 25.24% | 16.67% | 24.36% | 12.89% | 24.12% | 12.97% | 26.00% | 15.37% |
| JAPAN | W | 176,942 | 1,162 | 205,753 | 949 | 243,776 | 938 | 223,285 | 764 | 194,385 | 760 |
| | | 24.04% | 11.83% | 25.37% | 9.05% | 24.81% | 6.65% | 21.01% | 4.79% | 20.14% | 4.34% |
| UNTD KINGDOM | W | 37,617 | 649 | 44,820 | 512 | 74,494 | 968 | 80,851 | 1,113 | 71,658 | 802 |
| | | 5.11% | 6.61% | 5.53% | 4.88% | 7.58% | 6.86% | 7.61% | 6.97% | 7.42% | 4.58% |
| ITALY | W | 50,596 | 1,594 | 60,495 | 2,136 | 69,698 | 2,178 | 62,265 | 2,385 | 51,858 | 2,388 |
| | | 6.87% | 16.22% | 7.46% | 20.37% | 7.09% | 15.43% | 5.86% | 14.94% | 5.37% | 13.63% |
| SWITZ.LIECHT | W | 42,250 | 193 | 51,352 | 212 | 67,241 | 267 | 69,115 | 264 | 58,396 | 280 |
| | | 5.74% | 1.96% | 6.33% | 2.02% | 6.84% | 1.89% | 6.50% | 1.65% | 6.05% | 1.60% |
| FRANCE | W | 46,016 | 1,303 | 42,828 | 1,322 | 45,515 | 1,294 | 65,350 | 2,078 | 61,807 | 2,281 |
| | | 6.25% | 13.26% | 5.28% | 12.61% | 4.63% | 9.17% | 6.15% | 13.02% | 6.40% | 13.02% |
| NETHERLANDS | W | 34,711 | 520 | 42,964 | 300 | 62,754 | 350 | 63,315 | 804 | 55,515 | 1,345 |
| | | 4.72% | 5.29% | 5.30% | 2.86% | 6.39% | 2.48% | 5.96% | 5.04% | 5.75% | 7.68% |
| SWEDEN | W | 23,159 | 313 | 26,973 | 320 | 19,601 | 301 | 30,532 | 242 | 17,667 | 170 |
| | | 3.15% | 3.19% | 3.33% | 3.05% | 1.99% | 2.13% | 2.87% | 1.52% | 1.83% | 0.97% |
| MALAYSIA | W | 18,067 | 614 | 20,231 | 514 | 26,930 | 855 | 30,333 | 824 | 21,588 | 738 |
| | | 2.45% | 6.25% | 2.49% | 4.90% | 2.74% | 6.06% | 2.85% | 5.16% | 2.24% | 4.21% |
| CHINA | W | 905 | 49 | 6,820 | 174 | 11,721 | 169 | 32,272 | 523 | 35,180 | 607 |
| | | 0.12% | 0.50% | 0.84% | 1.66% | 1.19% | 1.20% | 3.04% | 3.28% | 3.64% | 3.46% |
| IRELAND | W | 8,655 | 172 | 14,588 | 118 | 14,940 | 183 | 24,023 | 332 | 23,356 | 351 |
| | | 1.18% | 1.75% | 1.80% | 1.13% | 1.52% | 1.30% | 2.26% | 2.08% | 2.42% | 2.00% |
| DENMARK | W | 8,524 | 401 | 9,207 | 452 | 16,511 | 980 | 22,272 | 721 | 14,451 | 637 |
| | | 1.16% | 4.08% | 1.14% | 4.31% | 1.68% | 6.94% | 2.10% | 4.52% | 1.50% | 3.64% |
| PAKISTAN | W | 11,431 | 228 | 12,558 | 244 | 12,944 | 244 | 15,552 | 278 | 14,292 | 267 |
| | | 1.55% | 2.32% | 1.55% | 2.33% | 1.32% | 1.73% | 1.46% | 1.74% | 1.48% | 1.52% |
| AUSTRIA | W | 17,472 | 71 | 18,509 | 90 | 5,811 | 46 | 6,981 | 51 | 5,365 | 47 |
| | | 2.37% | 0.72% | 2.28% | 0.86% | 0.59% | 0.33% | 0.66% | 0.32% | 0.56% | 0.27% |
| HUNGARY | W | 7,612 | 313 | 7,753 | 353 | 11,627 | 476 | 10,826 | 435 | 8,514 | 416 |
| | | 1.03% | 3.19% | 0.96% | 3.37% | 1.18% | 3.37% | 1.02% | 2.73% | 0.88% | 2.37% |

**Source: ITC Database PCTAS 1998. (W: Weight in Metric Tonnes, N: Number of Units, R: Rupture of Units) Percentage (%): % share in trade**

# ANNEXURE 1.8

## SITC 87229
## Value in $'000'
## Germany Exports

| | | 1993 | | 1994 | | 1995 | | 1996 | | 1997 | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Country | Unit | Value | Quantity | Value | Quantity | Value | Quantity | Value | Quantity | Value | Quantity |
| **TOTAL WORLD** | **W** | **1,269,675** | **10,391** | **1,272,133** | **11,117** | **1,547,628** | **13,086** | **1,589,018** | **15,917** | **1,543,548** | **17,006** |
| | | | | | | | | | | | |
| USA,PR,USVI | W | 275,234 | 1,282 | 254,939 | 1,138 | 308,620 | 1,285 | 325,188 | 1,671 | 314,649 | 2,001 |
| | | 21.68% | 12.34% | 20.04% | 10.24% | 19.94% | 9.82% | 20.46% | 10.50% | 20.38% | 11.77% |
| FRANCE | W | 104,950 | 658 | 106,845 | 659 | 123,341 | 878 | 119,541 | 1,322 | 117,857 | 1,782 |
| | | 8.27% | 6.33% | 8.40% | 5.93% | 7.97% | 6.71% | 7.52% | 8.31% | 7.64% | 10.48% |
| ITALY | W | 86,843 | 558 | 94,478 | 640 | 108,624 | 708 | 115,833 | 812 | 110,495 | 772 |
| | | 6.84% | 5.37% | 7.43% | 5.76% | 7.02% | 5.41% | 7.29% | 5.10% | 7.16% | 4.54% |
| JAPAN | W | 73,087 | 257 | 65,140 | 203 | 85,869 | 229 | 87,733 | 288 | 90,311 | 366 |
| | | 5.76% | 2.47% | 5.12% | 1.83% | 5.55% | 1.75% | 5.52% | 1.81% | 5.85% | 2.15% |
| AUSTRIA | W | 72,445 | 1,041 | 70,191 | 1,148 | 63,111 | 1,187 | 70,894 | 1,524 | 53,924 | 909 |
| | | 5.71% | 10.02% | 5.52% | 10.33% | 4.08% | 9.07% | 4.46% | 9.57% | 3.49% | 5.35% |
| SPAIN | W | 41,244 | 357 | 42,262 | 374 | 60,112 | 696 | 60,051 | 683 | 61,783 | 820 |
| | | 3.25% | 3.44% | 3.32% | 3.36% | 3.88% | 5.32% | 3.78% | 4.29% | 4.00% | 4.82% |
| SWITZ.LIECHT | W | 43,509 | 612 | 46,744 | 657 | 56,372 | 748 | 58,502 | 822 | 59,369 | 835 |
| | | 3.43% | 5.89% | 3.67% | 5.91% | 3.64% | 5.72% | 3.68% | 5.16% | 3.85% | 4.91% |
| RUSSIAN FED | W | 40,035 | 177 | 49,443 | 222 | 57,545 | 345 | 43,112 | 340 | 54,302 | 447 |
| | | 3.15% | 1.70% | 3.89% | 2.00% | 3.72% | 2.64% | 2.71% | 2.14% | 3.52% | 2.63% |
| UNTD KINGDOM | W | 44,800 | 592 | 42,105 | 551 | 52,206 | 652 | 52,293 | 678 | 46,010 | 615 |
| | | 3.53% | 5.70% | 3.31% | 4.96% | 3.37% | 4.98% | 3.29% | 4.26% | 2.98% | 3.62% |
| NETHERLANDS | W | 41,002 | 578 | 41,308 | 651 | 48,393 | 658 | 47,744 | 889 | 37,643 | 742 |
| | | 3.23% | 5.56% | 3.25% | 5.86% | 3.13% | 5.03% | 3.00% | 5.59% | 2.44% | 4.36% |
| BELGIUM-LUX | W | 30,725 | 442 | 30,643 | 407 | 31,858 | 403 | 35,500 | 494 | 28,986 | 518 |
| | | 2.42% | 4.25% | 2.41% | 3.66% | 2.06% | 3.08% | 2.23% | 3.10% | 1.88% | 3.05% |
| POLAND | W | 20,300 | 186 | 20,190 | 209 | 27,130 | 317 | 25,664 | 344 | 33,586 | 691 |
| | | 1.60% | 1.79% | 1.59% | 1.88% | 1.75% | 2.42% | 1.62% | 2.16% | 2.18% | 4.06% |
| SWEDEN | W | 21,716 | 336 | 22,254 | 377 | 25,159 | 334 | 24,635 | 625 | 22,162 | 416 |
| | | 1.71% | 3.23% | 1.75% | 3.39% | 1.63% | 2.55% | 1.55% | 3.93% | 1.44% | 2.45% |
| TURKEY | W | 18,651 | 151 | 15,694 | 122 | 15,666 | 149 | 22,134 | 218 | 31,528 | 385 |
| | | 1.47% | 1.45% | 1.23% | 1.10% | 1.01% | 1.14% | 1.39% | 1.37% | 2.04% | 2.26% |
| CZECH REP | W | 12,704 | 151 | 20,647 | 281 | 19,952 | 388 | 22,480 | 513 | 16,900 | 532 |
| | | 1.00% | 1.45% | 1.62% | 2.53% | 1.29% | 2.97% | 1.41% | 3.22% | 1.09% | 3.13% |

**Source: ITC Database PCTAS 1998. (W: Weight in Metric Tonnes, N: Number of Units, R: Rupture of Units) Percentage (%): % share in trade**

# ANNEXURE 1.9

## SITC 87229
## Value in $'000'
## Japan Imports

| | | 1993 | | 1994 | | 1995 | | 1996 | | 1997 | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Country** | **Unit** | **Value** | **Quantity** | **Value** | **Quantity** | **Value** | **Quantity** | **Value** | **Quantity** | **Value** | **Quantity** |
| **TOTAL WORLD** | **W** | **480,485** | **4,312** | **555,894** | **4,626** | **729,917** | **5,395** | **747,063** | **6,744** | **743,133** | **7,735** |
| | | | | | | | | | | | |
| USA,PR,USVI | W | 253,197 | 1,531 | 309,206 | 1,766 | 403,426 | 1,947 | 426,557 | 2,374 | 424,986 | 2,409 |
| | | 52.70% | 35.51% | 55.62% | 38.18% | 55.27% | 36.09% | 57.10% | 35.20% | 57.19% | 31.14% |
| GERMANY | W | 92,114 | 314 | 96,905 | 414 | 119,778 | 407 | 103,000 | 380 | 86,502 | 339 |
| | | 19.17% | 7.28% | 17.43% | 8.95% | 16.41% | 7.54% | 13.79% | 5.63% | 11.64% | 4.38% |
| SINGAPORE | W | 67,100 | 1,376 | 80,627 | 1,304 | 79,088 | 1,263 | 79,627 | 1,408 | 84,305 | 1,556 |
| | | 13.97% | 31.91% | 14.50% | 28.19% | 10.84% | 23.41% | 10.66% | 20.88% | 11.34% | 20.12% |
| IRELAND | W | 2,190 | 17 | 4,742 | 61 | 40,218 | 449 | 39,738 | 529 | 35,349 | 475 |
| | | 0.46% | 0.39% | 0.85% | 1.32% | 5.51% | 8.32% | 5.32% | 7.84% | 4.76% | 6.14% |
| FRANCE | W | 22,868 | 219 | 12,864 | 170 | 13,454 | 172 | 17,388 | 198 | 15,526 | 228 |
| | | 4.76% | 5.08% | 2.31% | 3.67% | 1.84% | 3.19% | 2.33% | 2.94% | 2.09% | 2.95% |
| SWITZ.LIECHT | W | 5,344 | 14 | 6,433 | 16 | 15,015 | 28 | 10,001 | 22 | 16,412 | 35 |
| | | 1.11% | 0.32% | 1.16% | 0.35% | 2.06% | 0.52% | 1.34% | 0.33% | 2.21% | 0.45% |
| UNTD KINGDOM | W | 5,137 | 28 | 6,602 | 31 | 8,801 | 41 | 9,827 | 49 | 8,230 | 48 |
| | | 1.07% | 0.65% | 1.19% | 0.67% | 1.21% | 0.76% | 1.32% | 0.73% | 1.11% | 0.62% |
| SWEDEN | W | 7,432 | 39 | 6,856 | 32 | 8,686 | 48 | 7,389 | 55 | 7,622 | 55 |
| | | 1.55% | 0.90% | 1.23% | 0.69% | 1.19% | 0.89% | 0.99% | 0.82% | 1.03% | 0.71% |
| ITALY | W | 6,578 | 36 | 7,419 | 49 | 8,461 | 45 | 7,852 | 50 | 6,474 | 43 |
| | | 1.37% | 0.83% | 1.33% | 1.06% | 1.16% | 0.83% | 1.05% | 0.74% | 0.87% | 0.56% |
| ISRAEL | W | 3,391 | 3 | 4,603 | 10 | 2,521 | 7 | 9,054 | 18 | 9,502 | 27 |
| | | 0.71% | 0.07% | 0.83% | 0.22% | 0.35% | 0.13% | 1.21% | 0.27% | 1.28% | 0.35% |
| CHINA | W | 2,042 | 142 | 2,919 | 212 | 4,352 | 305 | 6,925 | 610 | 11,226 | 1,173 |
| | | 0.42% | 3.29% | 0.53% | 4.58% | 0.60% | 5.65% | 0.93% | 9.05% | 1.51% | 15.16% |
| THAILAND | W | 637 | 44 | 1,675 | 108 | 1,484 | 121 | 4,198 | 330 | 8,874 | 521 |
| | | 0.13% | 1.02% | 0.30% | 2.33% | 0.20% | 2.24% | 0.56% | 4.89% | 1.19% | 6.74% |
| OTH.ASIA NES | W | 4,443 | 386 | 2,497 | 210 | 2,643 | 231 | 3,199 | 291 | 2,760 | 272 |
| | | 0.92% | 8.95% | 0.45% | 4.54% | 0.36% | 4.28% | 0.43% | 4.31% | 0.37% | 3.52% |
| NETHERLANDS | W | 308 | 1 | 1,177 | 2 | 2,430 | 3 | 2,469 | 9 | 6,031 | 57 |
| | | 0.06% | 0.02% | 0.21% | 0.04% | 0.33% | 0.06% | 0.33% | 0.13% | 0.81% | 0.74% |
| CANADA | W | 1,477 | 47 | 2,762 | 99 | 3,337 | 96 | 2,324 | 67 | 1,483 | 20 |
| | | 0.31% | 1.09% | 0.50% | 2.14% | 0.46% | 1.78% | 0.31% | 0.99% | 0.20% | 0.26% |

**Source: ITC Database PCTAS 1998. (W: Weight in Metric Tonnes, N: Number of Units, R: Rupture of Units) Percentage (%): % share in trade**

# ANNEXURE 1.10

## SITC 87229
## Value in $'000'
## Japan Exports

| | | 1993 | | 1994 | | 1995 | | 1996 | | 1997 | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Country | Unit | Value | Quantity | Value | Quantity | Value | Quantity | Value | Quantity | Value | Quantity |
| **TOTAL WORLD** | **W** | **838,501** | **10,715** | **820,951** | **10,966** | **826,611** | **10,354** | **782,103** | **10,915** | **852,417** | **11,998** |
| | | | | | | | | | | | |
| USA,PR,USVI | W | 294,359 | 3,307 | 295,392 | 3,582 | 271,414 | 2,662 | 261,354 | 2,692 | 336,821 | 3,051 |
| | | 35.11% | 30.86% | 35.98% | 32.66% | 32.83% | 25.71% | 33.42% | 24.66% | 39.51% | 25.43% |
| GERMANY | W | 189,109 | 1,401 | 145,925 | 1,070 | 164,882 | 1,020 | 153,327 | 1,244 | 127,710 | 1,207 |
| | | 22.55% | 13.08% | 17.78% | 9.76% | 19.95% | 9.85% | 19.60% | 11.40% | 14.98% | 10.06% |
| BELGIUM-LUX | W | 39,297 | 747 | 51,823 | 1,013 | 53,172 | 1,080 | 48,020 | 1,017 | 49,321 | 1,120 |
| | | 4.69% | 6.97% | 6.31% | 9.24% | 6.43% | 10.43% | 6.14% | 9.32% | 5.79% | 9.33% |
| OTH.ASIA NES | W | 29,837 | 900 | 31,245 | 815 | 34,711 | 773 | 35,990 | 930 | 37,666 | 1,106 |
| | | 3.56% | 8.40% | 3.81% | 7.43% | 4.20% | 7.47% | 4.60% | 8.52% | 4.42% | 9.22% |
| KOREA REP. | W | 28,572 | 347 | 34,997 | 359 | 29,433 | 259 | 26,501 | 293 | 29,400 | 535 |
| | | 3.41% | 3.24% | 4.26% | 3.27% | 3.56% | 2.50% | 3.39% | 2.68% | 3.45% | 4.46% |
| ITALY | W | 17,979 | 535 | 19,806 | 626 | 21,551 | 629 | 19,993 | 623 | 28,455 | 596 |
| | | 2.14% | 4.99% | 2.41% | 5.71% | 2.61% | 6.07% | 2.56% | 5.71% | 3.34% | 4.97% |
| UNTD KINGDOM | W | 25,379 | 69 | 22,981 | 93 | 21,469 | 157 | 17,609 | 58 | 17,470 | 54 |
| | | 3.03% | 0.64% | 2.80% | 0.85% | 2.60% | 1.52% | 2.25% | 0.53% | 2.05% | 0.45% |
| FRANCE | W | 17,234 | 271 | 20,217 | 282 | 23,644 | 286 | 21,425 | 286 | 17,631 | 296 |
| | | 2.06% | 2.53% | 2.46% | 2.57% | 2.86% | 2.76% | 2.74% | 2.62% | 2.07% | 2.47% |
| RUSSIAN FED | W | 25,156 | 61 | 29,842 | 79 | 18,413 | 139 | 10,823 | 164 | 7,227 | 196 |
| | | 3.00% | 0.57% | 3.64% | 0.72% | 2.23% | 1.34% | 1.38% | 1.50% | 0.85% | 1.63% |
| HONG KONG | W | 12,869 | 94 | 15,358 | 108 | 15,175 | 102 | 21,078 | 142 | 22,715 | 156 |
| | | 1.53% | 0.88% | 1.87% | 0.98% | 1.84% | 0.99% | 2.70% | 1.30% | 2.66% | 1.30% |
| SINGAPORE | W | 15,596 | 274 | 14,328 | 250 | 16,229 | 353 | 18,584 | 449 | 18,995 | 392 |
| | | 1.86% | 2.56% | 1.75% | 2.28% | 1.96% | 3.41% | 2.38% | 4.11% | 2.23% | 3.27% |
| CHINA | W | 11,094 | 125 | 9,167 | 109 | 16,558 | 141 | 16,066 | 203 | 19,791 | 311 |
| | | 1.32% | 1.17% | 1.12% | 0.99% | 2.00% | 1.36% | 2.05% | 1.86% | 2.32% | 2.59% |
| AUSTRALIA | W | 13,376 | 160 | 12,752 | 115 | 13,915 | 126 | 13,553 | 134 | 12,531 | 126 |
| | | 1.60% | 1.49% | 1.55% | 1.05% | 1.68% | 1.22% | 1.73% | 1.23% | 1.47% | 1.05% |
| THAILAND | W | 7,203 | 214 | 8,085 | 188 | 7,972 | 202 | 10,128 | 257 | 17,138 | 283 |
| | | 0.86% | 2.00% | 0.98% | 1.71% | 0.96% | 1.95% | 1.29% | 2.35% | 2.01% | 2.36% |
| CANADA | W | 8,125 | 129 | 9,860 | 229 | 11,194 | 259 | 8,992 | 293 | 7,117 | 137 |
| | | 0.97% | 1.20% | 1.20% | 2.09% | 1.35% | 2.50% | 1.15% | 2.68% | 0.83% | 1.14% |

**Source: ITC Database PCTAS 1998. (W: Weight in Metric Tonnes, N: Number of Units, R: Rupture of Units) Percentage (%): % share in trade**

# ANNEXURE 1.11

## SITC 87229
## Value in $'000'
## United Kingdom Imports

| | | 1993 | | 1994 | | 1995 | | 1996 | | 1997 | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Country | Unit | Value | Quantity | Value | Quantity | Value | Quantity | Value | Quantity | Value | Quantity |
| **TOTAL WORLD** | **W** | **453,627** | **16,216** | **512,785** | **12,979** | **561,589** | **15,566** | **571,614** | **14,999** | **650,599** | **15,768** |
| | | | | | | | | | | | |
| USA,PR,USVI | W | 214,540 | 3,212 | 238,208 | 3,990 | 248,495 | 4,027 | 262,884 | 3,637 | 268,226 | 3,610 |
| | | 47.29% | 19.81% | 46.45% | 30.74% | 44.25% | 25.87% | 45.99% | 24.25% | 41.23% | 22.89% |
| GERMANY | W | 52,528 | 2,953 | 61,249 | 2,746 | 64,609 | 2,313 | 70,646 | 2,848 | 70,418 | 3,647 |
| | | 11.58% | 18.21% | 11.94% | 21.16% | 11.50% | 14.86% | 12.36% | 18.99% | 10.82% | 23.13% |
| NETHERLANDS | W | 26,151 | 1,384 | 27,540 | 1,390 | 45,405 | 1,858 | 52,411 | 3,662 | 71,522 | 2,563 |
| | | 5.76% | 8.53% | 5.37% | 10.71% | 8.09% | 11.94% | 9.17% | 24.41% | 10.99% | 16.25% |
| JAPAN | W | 24,548 | 122 | 36,955 | 132 | 33,006 | 144 | 25,156 | 93 | 25,757 | 95 |
| | | 5.41% | 0.75% | 7.21% | 1.02% | 5.88% | 0.93% | 4.40% | 0.62% | 3.96% | 0.60% |
| BELGIUM-LUX | W | 17,634 | 5,446 | 18,630 | 947 | 25,085 | 3,240 | 23,157 | 504 | 29,079 | 640 |
| | | 3.89% | 33.58% | 3.63% | 7.30% | 4.47% | 20.81% | 4.05% | 3.36% | 4.47% | 4.06% |
| FRANCE | W | 16,022 | 372 | 17,005 | 457 | 21,239 | 356 | 23,217 | 314 | 32,837 | 969 |
| | | 3.53% | 2.29% | 3.32% | 3.52% | 3.78% | 2.29% | 4.06% | 2.09% | 5.05% | 6.15% |
| SWEDEN | W | 16,846 | 616 | 14,380 | 496 | 18,179 | 504 | 24,922 | 1,395 | 25,979 | 1,036 |
| | | 3.71% | 3.80% | 2.80% | 3.82% | 3.24% | 3.24% | 4.36% | 9.30% | 3.99% | 6.57% |
| IRELAND | W | 16,683 | 473 | 12,790 | 619 | 14,921 | 895 | 13,475 | 297 | 34,360 | 688 |
| | | 3.68% | 2.92% | 2.49% | 4.77% | 2.66% | 5.75% | 2.36% | 1.98% | 5.28% | 4.36% |
| ITALY | W | 10,206 | 256 | 12,829 | 473 | 9,748 | 730 | 10,909 | 558 | 11,105 | 365 |
| | | 2.25% | 1.58% | 2.50% | 3.64% | 1.74% | 4.69% | 1.91% | 3.72% | 1.71% | 2.31% |
| SWITZ.LIECHT | W | 9,982 | 71 | 12,487 | 76 | 11,476 | 59 | 9,647 | 55 | 8,865 | 69 |
| | | 2.20% | 0.44% | 2.44% | 0.59% | 2.04% | 0.38% | 1.69% | 0.37% | 1.36% | 0.44% |
| NORWAY | W | 7,551 | 139 | 10,041 | 159 | 8,448 | 116 | 10,077 | 164 | 11,897 | 140 |
| | | 1.66% | 0.86% | 1.96% | 1.23% | 1.50% | 0.75% | 1.76% | 1.09% | 1.83% | 0.89% |
| DENMARK | W | 9,734 | 143 | 10,076 | 351 | 5,503 | 229 | 4,678 | 218 | 4,887 | 174 |
| | | 2.15% | 0.88% | 1.96% | 2.70% | 0.98% | 1.47% | 0.82% | 1.45% | 0.75% | 1.10% |
| AUSTRALIA | W | 3,644 | 122 | 5,167 | 192 | 7,026 | 189 | 4,972 | 114 | 5,296 | 134 |
| | | 0.80% | 0.75% | 1.01% | 1.48% | 1.25% | 1.21% | 0.87% | 0.76% | 0.81% | 0.85% |
| PORTUGAL | W | 2,822 | 27 | 8,279 | 151 | 5,215 | 51 | 1,838 | 28 | 5,207 | 63 |
| | | 0.62% | 0.17% | 1.61% | 1.16% | 0.93% | 0.33% | 0.32% | 0.19% | 0.80% | 0.40% |
| CANADA | W | 2,481 | 37 | 3,860 | 27 | 5,943 | 102 | 4,069 | 190 | 6,749 | 451 |
| | | 0.55% | 0.23% | 0.75% | 0.21% | 1.06% | 0.66% | 0.71% | 1.27% | 1.04% | 2.86% |

**Source: ITC Database PCTAS 1998. (W: Weight in Metric Tonnes, N: Number of Units, R: Rupture of Units) Percentage (%): % share in trade**

# ANNEXURE 1.12

## SITC 87229
## Value in $'000'
## United Kingdom Exports

| | | 1993 | | 1994 | | 1995 | | 1996 | | 1997 | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Country | Unit | Value | Quantity | Value | Quantity | Value | Quantity | Value | Quantity | Value | Quantity |
| **TOTAL WORLD** | **W** | **488,689** | **15,034** | **585,869** | **15,924** | **680,526** | **18,116** | **771,470** | **23,253** | **851,344** | **22,812** |
| | | | | | | | | | | | |
| GERMANY | W | 48,778 | 938 | 71,118 | 959 | 92,869 | 1,315 | 107,531 | 1,831 | 102,842 | 1,777 |
| | | 9.98% | 6.24% | 12.14% | 6.02% | 13.65% | 7.26% | 13.94% | 7.87% | 12.08% | 7.79% |
| BELGIUM-LUX | W | 55,466 | 6,427 | 66,635 | 7,157 | 80,452 | 8,616 | 93,465 | 9,776 | 99,601 | 10,171 |
| | | 11.35% | 42.75% | 11.37% | 44.94% | 11.82% | 47.56% | 12.12% | 42.04% | 11.70% | 44.59% |
| USA,PR,USVI | W | 69,251 | 1,072 | 72,294 | 1,120 | 88,067 | 1,203 | 70,515 | 940 | 84,115 | 806 |
| | | 14.17% | 7.13% | 12.34% | 7.03% | 12.94% | 6.64% | 9.14% | 4.04% | 9.88% | 3.53% |
| FRANCE | W | 30,760 | 896 | 42,390 | 634 | 54,956 | 653 | 60,600 | 1,738 | 66,011 | 1,110 |
| | | 6.29% | 5.96% | 7.24% | 3.98% | 8.08% | 3.60% | 7.86% | 7.47% | 7.75% | 4.87% |
| JAPAN | W | 25,855 | 236 | 34,501 | 377 | 32,734 | 322 | 49,048 | 1,299 | 50,198 | 356 |
| | | 5.29% | 1.57% | 5.89% | 2.37% | 4.81% | 1.78% | 6.36% | 5.59% | 5.90% | 1.56% |
| IRELAND | W | 16,095 | 568 | 22,071 | 710 | 26,757 | 778 | 29,585 | 716 | 50,153 | 1,695 |
| | | 3.29% | 3.78% | 3.77% | 4.46% | 3.93% | 4.29% | 3.83% | 3.08% | 5.89% | 7.43% |
| ITALY | W | 17,084 | 685 | 20,313 | 433 | 23,918 | 399 | 33,023 | 561 | 33,487 | 467 |
| | | 3.50% | 4.56% | 3.47% | 2.72% | 3.51% | 2.20% | 4.28% | 2.41% | 3.93% | 2.05% |
| NETHERLANDS | W | 9,662 | 166 | 16,405 | 319 | 24,660 | 352 | 32,310 | 457 | 36,286 | 505 |
| | | 1.98% | 1.10% | 2.80% | 2.00% | 3.62% | 1.94% | 4.19% | 1.97% | 4.26% | 2.21% |
| SPAIN | W | 12,999 | 292 | 14,160 | 321 | 16,061 | 440 | 29,491 | 456 | 27,247 | 614 |
| | | 2.66% | 1.94% | 2.42% | 2.02% | 2.36% | 2.43% | 3.82% | 1.96% | 3.20% | 2.69% |
| AUSTRALIA | W | 13,277 | 288 | 15,971 | 328 | 16,154 | 260 | 20,239 | 314 | 27,217 | 394 |
| | | 2.72% | 1.92% | 2.73% | 2.06% | 2.37% | 1.44% | 2.62% | 1.35% | 3.20% | 1.73% |
| S.AFR.CUS.UN | W | 11,758 | 240 | 9,695 | 125 | 13,688 | 177 | 17,153 | 240 | 13,908 | 140 |
| | | 2.41% | 1.60% | 1.65% | 0.78% | 2.01% | 0.98% | 2.22% | 1.03% | 1.63% | 0.61% |
| SWEDEN | W | 8,728 | 470 | 14,239 | 174 | 10,617 | 109 | 11,618 | 123 | 13,261 | 170 |
| | | 1.79% | 3.13% | 2.43% | 1.09% | 1.56% | 0.60% | 1.51% | 0.53% | 1.56% | 0.75% |
| SWITZ.LIECHT | W | 8,709 | 142 | 8,080 | 101 | 13,237 | 154 | 13,634 | 145 | 11,959 | 131 |
| | | 1.78% | 0.94% | 1.38% | 0.63% | 1.95% | 0.85% | 1.77% | 0.62% | 1.40% | 0.57% |
| SAUDI ARABIA | W | 11,178 | 252 | 12,832 | 236 | 7,758 | 264 | 10,748 | 304 | 12,775 | 316 |
| | | 2.29% | 1.68% | 2.19% | 1.48% | 1.14% | 1.46% | 1.39% | 1.31% | 1.50% | 1.39% |
| AUSTRIA | W | 5,495 | 74 | 6,721 | 92 | 7,345 | 86 | 8,341 | 113 | 13,016 | 130 |
| | | 1.12% | 0.49% | 1.15% | 0.58% | 1.08% | 0.47% | 1.08% | 0.49% | 1.53% | 0.57% |

**Source: ITC Database PCTAS 1998. (W: Weight in Metric Tonnes, N: Number of Units, R: Rupture of Units) Percentage (%): % share in trade**

# ANNEXURE 1.13

## SITC 87229
## Value in $'000'
## France Imports

| | | 1993 | | 1994 | | 1995 | | 1996 | | 1997 | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Country | Unit | Value | Quantity | Value | Quantity | Value | Quantity | Value | Quantity | Value | Quantity |
| **TOTAL WORLD** | **W** | **617,548** | **11,020** | **638,643** | **9,557** | **745,672** | **11,391** | **784,609** | **11,695** | **796,948** | **11,237** |
| | | | | | | | | | | | |
| USA,PR,USVI | W | 216,368 | 1,731 | 235,507 | 1,796 | 257,900 | 1,906 | 317,089 | 2,244 | 328,979 | 2,214 |
| | | 35.04% | 15.71% | 36.88% | 18.79% | 34.59% | 16.73% | 40.41% | 19.19% | 41.28% | 19.70% |
| GERMANY | W | 87,543 | 1,886 | 87,684 | 995 | 112,355 | 1,609 | 104,566 | 1,815 | 92,664 | 1,318 |
| | | 14.18% | 17.11% | 13.73% | 10.41% | 15.07% | 14.13% | 13.33% | 15.52% | 11.63% | 11.73% |
| JAPAN | W | 90,610 | 1,323 | 87,213 | 705 | 88,136 | 731 | 92,863 | 742 | 94,160 | 905 |
| | | 14.67% | 12.01% | 13.66% | 7.38% | 11.82% | 6.42% | 11.84% | 6.34% | 11.82% | 8.05% |
| UNTD KINGDOM | W | 40,675 | 934 | 48,305 | 986 | 59,477 | 1,004 | 58,078 | 1,060 | 74,052 | 1,051 |
| | | 6.59% | 8.48% | 7.56% | 10.32% | 7.98% | 8.81% | 7.40% | 9.06% | 9.29% | 9.35% |
| ITALY | W | 42,025 | 1,429 | 49,258 | 1,707 | 56,337 | 2,122 | 47,611 | 1,904 | 48,489 | 2,079 |
| | | 6.81% | 12.97% | 7.71% | 17.86% | 7.56% | 18.63% | 6.07% | 16.28% | 6.08% | 18.50% |
| IRELAND | W | 14,042 | 477 | 20,968 | 651 | 29,712 | 794 | 23,511 | 591 | 16,638 | 501 |
| | | 2.27% | 4.33% | 3.28% | 6.81% | 3.98% | 6.97% | 3.00% | 5.05% | 2.09% | 4.46% |
| ISRAEL | W | 25,500 | 206 | 25,684 | 191 | 25,623 | 187 | 8,558 | 46 | 9,916 | 54 |
| | | 4.13% | 1.87% | 4.02% | 2.00% | 3.44% | 1.64% | 1.09% | 0.39% | 1.24% | 0.48% |
| BELGIUM-LUX | W | 20,962 | 876 | 18,964 | 636 | 23,192 | 806 | 18,610 | 649 | 9,803 | 352 |
| | | 3.39% | 7.95% | 2.97% | 6.65% | 3.11% | 7.08% | 2.37% | 5.55% | 1.23% | 3.13% |
| SWEDEN | W | 16,233 | 244 | 11,544 | 176 | 19,704 | 268 | 23,432 | 337 | 18,593 | 213 |
| | | 2.63% | 2.21% | 1.81% | 1.84% | 2.64% | 2.35% | 2.99% | 2.88% | 2.33% | 1.90% |
| SWITZ.LIECHT | W | 9,924 | 38 | 7,023 | 114 | 11,337 | 132 | 13,952 | 109 | 17,231 | 144 |
| | | 1.61% | 0.34% | 1.10% | 1.19% | 1.52% | 1.16% | 1.78% | 0.93% | 2.16% | 1.28% |
| FINLAND | W | 1,958 | 6 | 2,364 | 25 | 11,514 | 42 | 16,596 | 122 | 23,018 | 308 |
| | | 0.32% | 0.05% | 0.37% | 0.26% | 1.54% | 0.37% | 2.12% | 1.04% | 2.89% | 2.74% |
| NETHERLANDS | W | 6,254 | 138 | 5,511 | 177 | 7,264 | 219 | 14,924 | 296 | 12,911 | 296 |
| | | 1.01% | 1.25% | 0.86% | 1.85% | 0.97% | 1.92% | 1.90% | 2.53% | 1.62% | 2.63% |
| DENMARK | W | 6,456 | 103 | 5,296 | 130 | 5,301 | 144 | 10,168 | 183 | 8,586 | 179 |
| | | 1.05% | 0.93% | 0.83% | 1.36% | 0.71% | 1.26% | 1.30% | 1.56% | 1.08% | 1.59% |
| AREAS NES | W | 13,197 | 0 | 7,721 | 72 | 5,936 | 68 | 484 | 1 | 7,469 | 30 |
| | | 2.14% | 0.00% | 1.21% | 0.75% | 0.80% | 0.60% | 0.06% | 0.01% | 0.94% | 0.27% |
| MALTA | W | 7,986 | 433 | 6,334 | 360 | 9,889 | 501 | 7,935 | 432 | 2,101 | 153 |
| | | 1.29% | 3.93% | 0.99% | 3.77% | 1.33% | 4.40% | 1.01% | 3.69% | 0.26% | 1.36% |

**Source: ITC Database PCTAS 1998. (W: Weight in Metric Tonnes, N: Number of Units, R: Rupture of Units) Percentage (%): % share in trade**

# ANNEXURE 1.14

## SITC 87229
## Value in $'000'
## France Exports

| | | 1993 | | 1994 | | 1995 | | 1996 | | 1997 | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Country** | **Unit** | **Value** | **Quantity** | **Value** | **Quantity** | **Value** | **Quantity** | **Value** | **Quantity** | **Value** | **Quantity** |
| **TOTAL WORLD** | **W** | **413,736** | **6,568** | **441,693** | **7,875** | **479,339** | **8,312** | **490,587** | **7,956** | **502,088** | **9,369** |
| | | | | | | | | | | | |
| GERMANY | W | 55,925 | 1,077 | 71,967 | 1,048 | 82,909 | 1,526 | 80,483 | 1,813 | 63,359 | 1,641 |
| | | 13.52% | 16.40% | 16.29% | 13.31% | 17.30% | 18.36% | 16.41% | 22.79% | 12.62% | 17.52% |
| ITALY | W | 55,860 | 706 | 54,499 | 601 | 56,410 | 772 | 84,981 | 885 | 91,486 | 971 |
| | | 13.50% | 10.75% | 12.34% | 7.63% | 11.77% | 9.29% | 17.32% | 11.12% | 18.22% | 10.36% |
| BELGIUM-LUX | W | 20,155 | 550 | 25,071 | 1,172 | 29,179 | 890 | 37,353 | 970 | 41,033 | 1,204 |
| | | 4.87% | 8.37% | 5.68% | 14.88% | 6.09% | 10.71% | 7.61% | 12.19% | 8.17% | 12.85% |
| SPAIN | W | 18,947 | 312 | 20,558 | 353 | 25,597 | 444 | 44,303 | 583 | 42,795 | 495 |
| | | 4.58% | 4.75% | 4.65% | 4.48% | 5.34% | 5.34% | 9.03% | 7.33% | 8.52% | 5.28% |
| USA,PR,USVI | W | 21,835 | 137 | 20,596 | 171 | 21,311 | 191 | 24,523 | 208 | 30,050 | 238 |
| | | 5.28% | 2.09% | 4.66% | 2.17% | 4.45% | 2.30% | 5.00% | 2.61% | 5.99% | 2.54% |
| UNTD KINGDOM | W | 13,097 | 166 | 15,797 | 260 | 21,356 | 359 | 22,597 | 251 | 32,337 | 1,015 |
| | | 3.17% | 2.53% | 3.58% | 3.30% | 4.46% | 4.32% | 4.61% | 3.15% | 6.44% | 10.83% |
| JAPAN | W | 27,652 | 278 | 17,430 | 196 | 11,706 | 190 | 15,119 | 212 | 12,649 | 210 |
| | | 6.68% | 4.23% | 3.95% | 2.49% | 2.44% | 2.29% | 3.08% | 2.66% | 2.52% | 2.24% |
| SWITZ.LIECHT | W | 12,140 | 220 | 15,277 | 254 | 14,292 | 230 | 16,336 | 238 | 15,697 | 260 |
| | | 2.93% | 3.35% | 3.46% | 3.23% | 2.98% | 2.77% | 3.33% | 2.99% | 3.13% | 2.78% |
| ALGERIA | W | 12,949 | 270 | 11,066 | 162 | 13,322 | 150 | 11,817 | 167 | 17,771 | 307 |
| | | 3.13% | 4.11% | 2.51% | 2.06% | 2.78% | 1.80% | 2.41% | 2.10% | 3.54% | 3.28% |
| SWEDEN | W | 8,534 | 291 | 11,838 | 421 | 13,856 | 469 | 14,339 | 445 | 11,200 | 269 |
| | | 2.06% | 4.43% | 2.68% | 5.35% | 2.89% | 5.64% | 2.92% | 5.59% | 2.23% | 2.87% |
| RUSSIAN FED | W | 18,759 | 119 | 16,823 | 121 | 12,254 | 116 | 6,068 | 41 | 3,675 | 49 |
| | | 4.53% | 1.81% | 3.81% | 1.54% | 2.56% | 1.40% | 1.24% | 0.52% | 0.73% | 0.52% |
| NETHERLANDS | W | 4,671 | 68 | 6,238 | 202 | 10,482 | 123 | 14,054 | 98 | 12,917 | 110 |
| | | 1.13% | 1.04% | 1.41% | 2.57% | 2.19% | 1.48% | 2.86% | 1.23% | 2.57% | 1.17% |
| REUNION | W | 14,267 | 274 | 12,841 | 252 | 17,586 | 329 | 0 | 0 | 0 | 0 |
| | | 3.45% | 4.17% | 2.91% | 3.20% | 3.67% | 3.96% | 0.00% | 0.00% | 0.00% | 0.00% |
| MOROCCO | W | 4,232 | 86 | 6,674 | 143 | 5,580 | 114 | 5,013 | 134 | 8,674 | 178 |
| | | 1.02% | 1.31% | 1.51% | 1.82% | 1.16% | 1.37% | 1.02% | 1.68% | 1.73% | 1.90% |
| TUNISIA | W | 5,493 | 64 | 4,321 | 80 | 4,889 | 53 | 5,286 | 76 | 4,952 | 64 |
| | | 1.33% | 0.97% | 0.98% | 1.02% | 1.02% | 0.64% | 1.08% | 0.96% | 0.99% | 0.68% |

**Source: ITC Database PCTAS 1998. (W: Weight in Metric Tonnes, N: Number of Units, R: Rupture of Units) Percentage (%): % share in trade**

# ANNEXURE 1.15

## SITC 87229
## Value in $'000'
## Italy Imports

| | | 1993 | | 1994 | | 1995 | | 1996 | | 1997 | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Country | Unit | Value | Quantity | Value | Quantity | Value | Quantity | Value | Quantity | Value | Quantity |
| **TOTAL WORLD** | **W** | **503,583** | **6,548** | **515,764** | **8,022** | **567,440** | **8,759** | **616,495** | **9,072** | **618,825** | **9,827** |
| | | | | | | | | | | | |
| GERMANY | W | 125,808 | 1,013 | 124,747 | 1,051 | 137,209 | 1,068 | 145,261 | 1,157 | 134,246 | 1,175 |
| | | 24.98% | 15.47% | 24.19% | 13.10% | 24.18% | 12.19% | 23.56% | 12.75% | 21.69% | 11.96% |
| USA,PR,USVI | W | 129,727 | 797 | 128,193 | 895 | 128,651 | 898 | 118,651 | 822 | 122,353 | 744 |
| | | 25.76% | 12.17% | 24.85% | 11.16% | 22.67% | 10.25% | 19.25% | 9.06% | 19.77% | 7.57% |
| FRANCE | W | 66,256 | 807 | 58,222 | 781 | 58,319 | 787 | 97,887 | 1,251 | 101,570 | 1,007 |
| | | 13.16% | 12.32% | 11.29% | 9.74% | 10.28% | 8.99% | 15.88% | 13.79% | 16.41% | 10.25% |
| NETHERLANDS | W | 38,142 | 477 | 51,805 | 541 | 61,912 | 596 | 63,288 | 592 | 57,125 | 1,263 |
| | | 7.57% | 7.28% | 10.04% | 6.74% | 10.91% | 6.80% | 10.27% | 6.53% | 9.23% | 12.85% |
| BELGIUM-LUX | W | 26,166 | 778 | 32,528 | 1,161 | 40,819 | 1,416 | 42,567 | 1,542 | 48,096 | 1,413 |
| | | 5.20% | 11.88% | 6.31% | 14.47% | 7.19% | 16.17% | 6.90% | 17.00% | 7.77% | 14.38% |
| JAPAN | W | 28,496 | 541 | 30,902 | 558 | 39,160 | 574 | 31,092 | 528 | 24,970 | 545 |
| | | 5.66% | 8.26% | 5.99% | 6.96% | 6.90% | 6.55% | 5.04% | 5.82% | 4.04% | 5.55% |
| UNTD KINGDOM | W | 24,821 | 391 | 24,289 | 464 | 26,773 | 468 | 30,566 | 483 | 35,019 | 557 |
| | | 4.93% | 5.97% | 4.71% | 5.78% | 4.72% | 5.34% | 4.96% | 5.32% | 5.66% | 5.67% |
| SWEDEN | W | 14,777 | 586 | 16,133 | 722 | 15,561 | 531 | 22,164 | 330 | 21,660 | 365 |
| | | 2.93% | 8.95% | 3.13% | 9.00% | 2.74% | 6.06% | 3.60% | 3.64% | 3.50% | 3.71% |
| SWITZ.LIECHT | W | 10,484 | 94 | 9,525 | 77 | 9,598 | 53 | 13,769 | 42 | 15,085 | 54 |
| | | 2.08% | 1.44% | 1.85% | 0.96% | 1.69% | 0.61% | 2.23% | 0.46% | 2.44% | 0.55% |
| IRELAND | W | 11,362 | 136 | 10,317 | 143 | 10,788 | 128 | 11,774 | 136 | 13,030 | 173 |
| | | 2.26% | 2.08% | 2.00% | 1.78% | 1.90% | 1.46% | 1.91% | 1.50% | 2.11% | 1.76% |
| ISRAEL | W | 2,730 | 32 | 4,061 | 45 | 5,532 | 59 | 4,247 | 20 | 5,003 | 25 |
| | | 0.54% | 0.49% | 0.79% | 0.56% | 0.97% | 0.67% | 0.69% | 0.22% | 0.81% | 0.25% |
| SLOVENIA | W | 1,999 | 379 | 3,283 | 683 | 3,966 | 785 | 5,576 | 977 | 6,364 | 1,131 |
| | | 0.40% | 5.79% | 0.64% | 8.51% | 0.70% | 8.96% | 0.90% | 10.77% | 1.03% | 11.51% |
| DENMARK | W | 6,081 | 81 | 3,362 | 51 | 4,757 | 53 | 3,004 | 60 | 3,598 | 49 |
| | | 1.21% | 1.24% | 0.65% | 0.64% | 0.84% | 0.61% | 0.49% | 0.66% | 0.58% | 0.50% |
| SPAIN | W | 2,166 | 53 | 3,123 | 169 | 3,711 | 178 | 4,239 | 139 | 4,193 | 132 |
| | | 0.43% | 0.81% | 0.61% | 2.11% | 0.65% | 2.03% | 0.69% | 1.53% | 0.68% | 1.34% |
| CHINA | W | 728 | 51 | 2,668 | 178 | 4,235 | 245 | 4,882 | 260 | 4,662 | 315 |
| | | 0.14% | 0.78% | 0.52% | 2.22% | 0.75% | 2.80% | 0.79% | 2.87% | 0.75% | 3.21% |

**Source: ITC Database PCTAS 1998. (W: Weight in Metric Tonnes, N: Number of Units, R: Rupture of Units) Percentage (%): % share in trade**

# ANNEXURE 1.16

## SITC 87229
## Value in $'000'
## Italy Exports

| | | 1993 | | 1994 | | 1995 | | 1996 | | 1997 | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Country | Unit | Value | Quantity | Value | Quantity | Value | Quantity | Value | Quantity | Value | Quantity |
| **TOTAL WORLD** | **W** | **286,202** | **9,762** | **300,109** | **11,576** | **365,253** | **12,507** | **396,360** | **13,571** | **375,553** | **14,279** |
| | | | | | | | | | | | |
| GERMANY | W | 48,459 | 1,809 | 53,657 | 2,081 | 62,329 | 1,950 | 68,362 | 2,517 | 69,239 | 2,988 |
| | | 16.93% | 18.53% | 17.88% | 17.98% | 17.06% | 15.59% | 17.25% | 18.55% | 18.44% | 20.93% |
| FRANCE | W | 45,117 | 1,545 | 46,253 | 1,902 | 54,579 | 2,168 | 50,482 | 1,929 | 42,904 | 1,907 |
| | | 15.76% | 15.83% | 15.41% | 16.43% | 14.94% | 17.33% | 12.74% | 14.21% | 11.42% | 13.36% |
| USA,PR,USVI | W | 21,959 | 531 | 21,488 | 995 | 20,585 | 798 | 26,015 | 1,096 | 23,143 | 1,002 |
| | | 7.67% | 5.44% | 7.16% | 8.60% | 5.64% | 6.38% | 6.56% | 8.08% | 6.16% | 7.02% |
| SPAIN | W | 18,594 | 646 | 20,701 | 721 | 24,772 | 859 | 24,941 | 883 | 20,058 | 776 |
| | | 6.50% | 6.62% | 6.90% | 6.23% | 6.78% | 6.87% | 6.29% | 6.51% | 5.34% | 5.43% |
| GREECE | W | 14,799 | 476 | 13,343 | 492 | 13,705 | 491 | 15,967 | 529 | 28,952 | 665 |
| | | 5.17% | 4.88% | 4.45% | 4.25% | 3.75% | 3.93% | 4.03% | 3.90% | 7.71% | 4.66% |
| UNTD KINGDOM | W | 13,179 | 275 | 10,778 | 347 | 12,884 | 349 | 12,881 | 331 | 11,896 | 291 |
| | | 4.60% | 2.82% | 3.59% | 3.00% | 3.53% | 2.79% | 3.25% | 2.44% | 3.17% | 2.04% |
| BELGIUM-LUX | W | 9,646 | 353 | 8,921 | 393 | 10,687 | 436 | 10,363 | 493 | 11,777 | 565 |
| | | 3.37% | 3.62% | 2.97% | 3.39% | 2.93% | 3.49% | 2.61% | 3.63% | 3.14% | 3.96% |
| JAPAN | W | 6,107 | 57 | 10,417 | 86 | 8,529 | 73 | 10,958 | 140 | 8,126 | 110 |
| | | 2.13% | 0.58% | 3.47% | 0.74% | 2.34% | 0.58% | 2.76% | 1.03% | 2.16% | 0.77% |
| AUSTRIA | W | 6,823 | 222 | 6,852 | 281 | 9,240 | 375 | 9,779 | 402 | 8,841 | 412 |
| | | 2.38% | 2.27% | 2.28% | 2.43% | 2.53% | 3.00% | 2.47% | 2.96% | 2.35% | 2.89% |
| RUSSIAN FED | W | 5,620 | 87 | 7,073 | 135 | 8,274 | 248 | 13,024 | 300 | 5,872 | 221 |
| | | 1.96% | 0.89% | 2.36% | 1.17% | 2.27% | 1.98% | 3.29% | 2.21% | 1.56% | 1.55% |
| NETHERLANDS | W | 5,500 | 261 | 6,983 | 518 | 10,036 | 517 | 9,228 | 372 | 7,739 | 474 |
| | | 1.92% | 2.67% | 2.33% | 4.47% | 2.75% | 4.13% | 2.33% | 2.74% | 2.06% | 3.32% |
| SWEDEN | W | 4,164 | 167 | 3,706 | 161 | 6,539 | 206 | 11,139 | 478 | 7,178 | 334 |
| | | 1.45% | 1.71% | 1.23% | 1.39% | 1.79% | 1.65% | 2.81% | 3.52% | 1.91% | 2.34% |
| SWITZ.LIECHT | W | 6,488 | 221 | 4,978 | 141 | 6,035 | 117 | 5,687 | 165 | 5,097 | 189 |
| | | 2.27% | 2.26% | 1.66% | 1.22% | 1.65% | 0.94% | 1.43% | 1.22% | 1.36% | 1.32% |
| TURKEY | W | 3,372 | 117 | 2,983 | 154 | 6,829 | 161 | 6,181 | 150 | 6,260 | 170 |
| | | 1.18% | 1.20% | 0.99% | 1.33% | 1.87% | 1.29% | 1.56% | 1.11% | 1.67% | 1.19% |
| CANADA | W | 4,109 | 145 | 3,440 | 157 | 4,407 | 196 | 5,345 | 213 | 5,497 | 242 |
| | | 1.44% | 1.49% | 1.15% | 1.36% | 1.21% | 1.57% | 1.35% | 1.57% | 1.46% | 1.69% |

**Source: ITC Database PCTAS 1998. (W: Weight in Metric Tonnes, N: Number of Units, R: Rupture of Units) Percentage (%): % share in trade**

# ANNEXURE 1.17

## SITC 87229
## Value in $'000'
## Switzerland Imports

| | | 1993 | | 1994 | | 1995 | | 1996 | | 1997 | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Country | Unit | Value | Quantity | Value | Quantity | Value | Quantity | Value | Quantity | Value | Quantity |
| **TOTAL WORLD** | **W** | **123,564** | **1,418** | **144,321** | **1,610** | **166,711** | **1,673** | **174,455** | **1,726** | **167,953** | **1,763** |
| | | | | | | | | | | | |
| GERMANY | W | 60,551 | 577 | 67,252 | 654 | 78,040 | 702 | 71,342 | 725 | 78,317 | 795 |
| | | 49.00% | 40.69% | 46.60% | 40.62% | 46.81% | 41.96% | 40.89% | 42.00% | 46.63% | 45.09% |
| USA,PR,USVI | W | 23,906 | 178 | 27,112 | 189 | 29,312 | 191 | 37,895 | 176 | 34,033 | 177 |
| | | 19.35% | 12.55% | 18.79% | 11.74% | 17.58% | 11.42% | 21.72% | 10.20% | 20.26% | 10.04% |
| FRANCE | W | 7,376 | 149 | 10,403 | 208 | 11,351 | 193 | 12,829 | 212 | 11,340 | 206 |
| | | 5.97% | 10.51% | 7.21% | 12.92% | 6.81% | 11.54% | 7.35% | 12.28% | 6.75% | 11.68% |
| UNTD KINGDOM | W | 4,211 | 74 | 5,411 | 65 | 6,626 | 84 | 8,111 | 103 | 8,434 | 82 |
| | | 3.41% | 5.22% | 3.75% | 4.04% | 3.97% | 5.02% | 4.65% | 5.97% | 5.02% | 4.65% |
| NETHERLANDS | W | 4,410 | 72 | 6,145 | 87 | 7,323 | 95 | 7,508 | 87 | 6,653 | 87 |
| | | 3.57% | 5.08% | 4.26% | 5.40% | 4.39% | 5.68% | 4.30% | 5.04% | 3.96% | 4.93% |
| JAPAN | W | 5,274 | 42 | 4,837 | 22 | 6,715 | 38 | 7,577 | 38 | 4,050 | 24 |
| | | 4.27% | 2.96% | 3.35% | 1.37% | 4.03% | 2.27% | 4.34% | 2.20% | 2.41% | 1.36% |
| BELGIUM-LUX | W | 2,371 | 42 | 4,309 | 69 | 6,200 | 83 | 7,388 | 122 | 6,069 | 88 |
| | | 1.92% | 2.96% | 2.99% | 4.29% | 3.72% | 4.96% | 4.23% | 7.07% | 3.61% | 4.99% |
| AUSTRIA | W | 3,426 | 12 | 3,679 | 10 | 6,183 | 12 | 6,079 | 15 | 5,488 | 15 |
| | | 2.77% | 0.85% | 2.55% | 0.62% | 3.71% | 0.72% | 3.48% | 0.87% | 3.27% | 0.85% |
| ITALY | W | 4,192 | 131 | 4,746 | 122 | 3,925 | 113 | 3,499 | 105 | 2,873 | 103 |
| | | 3.39% | 9.24% | 3.29% | 7.58% | 2.35% | 6.75% | 2.01% | 6.08% | 1.71% | 5.84% |
| DENMARK | W | 1,613 | 24 | 2,149 | 26 | 2,981 | 40 | 3,564 | 57 | 2,503 | 74 |
| | | 1.31% | 1.69% | 1.49% | 1.61% | 1.79% | 2.39% | 2.04% | 3.30% | 1.49% | 4.20% |
| IRELAND | W | 1,935 | 26 | 2,094 | 25 | 1,837 | 26 | 2,064 | 26 | 2,101 | 48 |
| | | 1.57% | 1.83% | 1.45% | 1.55% | 1.10% | 1.55% | 1.18% | 1.51% | 1.25% | 2.72% |
| SWEDEN | W | 1,447 | 17 | 2,174 | 40 | 1,730 | 16 | 2,140 | 21 | 1,980 | 19 |
| | | 1.17% | 1.20% | 1.51% | 2.48% | 1.04% | 0.96% | 1.23% | 1.22% | 1.18% | 1.08% |
| ISRAEL | W | 335 | 2 | 567 | 3 | 880 | 3 | 1,906 | 4 | 1,160 | 3 |
| | | 0.27% | 0.14% | 0.39% | 0.19% | 0.53% | 0.18% | 1.09% | 0.23% | 0.69% | 0.17% |
| PORTUGAL | W | 920 | 32 | 1,368 | 56 | 1,227 | 46 | 373 | 7 | 27 | 0 |
| | | 0.74% | 2.26% | 0.95% | 3.48% | 0.74% | 2.75% | 0.21% | 0.41% | 0.02% | 0.00% |
| FINLAND | W | 317 | 11 | 362 | 3 | 242 | 1 | 281 | 1 | 803 | 3 |
| | | 0.26% | 0.78% | 0.25% | 0.19% | 0.15% | 0.06% | 0.16% | 0.06% | 0.48% | 0.17% |

**Source: ITC Database PCTAS 1998. (W: Weight in Metric Tonnes, N: Number of Units, R: Rupture of Units) Percentage (%): % share in trade**

# ANNEXURE 1.18

## SITC 87229
## Value in $'000'
## Switzerland Exports

| | | 1993 | | 1994 | | 1995 | | 1996 | | 1997 | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Country | Unit | Value | Quantity | Value | Quantity | Value | Quantity | Value | Quantity | Value | Quantity |
| **TOTAL WORLD** | **W** | **185,574** | **1,322** | **224,031** | **1,381** | **260,831** | **1,391** | **284,952** | **1,535** | **278,429** | **1,782** |
| | | | | | | | | | | | |
| GERMANY | W | 58,992 | 392 | 65,492 | 379 | 94,856 | 442 | 95,790 | 421 | 89,037 | 474 |
| | | 31.79% | 29.65% | 29.23% | 27.44% | 36.37% | 31.78% | 33.62% | 27.43% | 31.98% | 26.60% |
| USA,PR,USVI | W | 31,189 | 219 | 37,081 | 213 | 32,557 | 216 | 44,588 | 223 | 46,990 | 254 |
| | | 16.81% | 16.57% | 16.55% | 15.42% | 12.48% | 15.53% | 15.65% | 14.53% | 16.88% | 14.25% |
| FRANCE | W | 12,543 | 85 | 12,943 | 76 | 16,500 | 85 | 17,614 | 101 | 17,430 | 86 |
| | | 6.76% | 6.43% | 5.78% | 5.50% | 6.33% | 6.11% | 6.18% | 6.58% | 6.26% | 4.83% |
| ITALY | W | 7,767 | 65 | 15,030 | 77 | 12,221 | 100 | 15,206 | 171 | 17,264 | 291 |
| | | 4.19% | 4.92% | 6.71% | 5.58% | 4.69% | 7.19% | 5.34% | 11.14% | 6.20% | 16.33% |
| JAPAN | W | 4,356 | 21 | 4,246 | 19 | 13,536 | 37 | 11,635 | 36 | 16,294 | 54 |
| | | 2.35% | 1.59% | 1.90% | 1.38% | 5.19% | 2.66% | 4.08% | 2.35% | 5.85% | 3.03% |
| UNTD KINGDOM | W | 6,260 | 36 | 8,912 | 39 | 11,729 | 47 | 10,718 | 39 | 8,989 | 34 |
| | | 3.37% | 2.72% | 3.98% | 2.82% | 4.50% | 3.38% | 3.76% | 2.54% | 3.23% | 1.91% |
| AUSTRIA | W | 6,618 | 49 | 7,059 | 41 | 6,586 | 33 | 7,621 | 43 | 8,085 | 60 |
| | | 3.57% | 3.71% | 3.15% | 2.97% | 2.53% | 2.37% | 2.67% | 2.80% | 2.90% | 3.37% |
| SPAIN | W | 4,614 | 30 | 4,134 | 42 | 4,643 | 27 | 7,206 | 33 | 6,237 | 32 |
| | | 2.49% | 2.27% | 1.85% | 3.04% | 1.78% | 1.94% | 2.53% | 2.15% | 2.24% | 1.80% |
| NETHERLANDS | W | 4,287 | 30 | 3,275 | 24 | 5,829 | 33 | 5,175 | 30 | 8,237 | 110 |
| | | 2.31% | 2.27% | 1.46% | 1.74% | 2.23% | 2.37% | 1.82% | 1.95% | 2.96% | 6.17% |
| RUSSIAN FED | W | 5,913 | 77 | 5,429 | 90 | 3,131 | 16 | 5,857 | 29 | 4,598 | 47 |
| | | 3.19% | 5.82% | 2.42% | 6.52% | 1.20% | 1.15% | 2.06% | 1.89% | 1.65% | 2.64% |
| BELGIUM-LUX | W | 2,468 | 15 | 2,766 | 16 | 3,513 | 18 | 4,374 | 19 | 5,121 | 24 |
| | | 1.33% | 1.13% | 1.23% | 1.16% | 1.35% | 1.29% | 1.53% | 1.24% | 1.84% | 1.35% |
| AUSTRALIA | W | 1,448 | 13 | 4,531 | 16 | 3,292 | 16 | 3,002 | 18 | 2,846 | 14 |
| | | 0.78% | 0.98% | 2.02% | 1.16% | 1.26% | 1.15% | 1.05% | 1.17% | 1.02% | 0.79% |
| THAILAND | W | 1,593 | 5 | 2,308 | 4 | 3,552 | 8 | 3,212 | 8 | 2,288 | 8 |
| | | 0.86% | 0.38% | 1.03% | 0.29% | 1.36% | 0.58% | 1.13% | 0.52% | 0.82% | 0.45% |
| KOREA REP. | W | 1,823 | 12 | 3,461 | 14 | 3,734 | 14 | 2,030 | 12 | 1,737 | 11 |
| | | 0.98% | 0.91% | 1.54% | 1.01% | 1.43% | 1.01% | 0.71% | 0.78% | 0.62% | 0.62% |
| SWEDEN | W | 1,994 | 27 | 2,243 | 19 | 2,486 | 27 | 2,363 | 9 | 2,453 | 19 |
| | | 1.07% | 2.04% | 1.00% | 1.38% | 0.95% | 1.94% | 0.83% | 0.59% | 0.88% | 1.07% |

**Source: ITC Database PCTAS 1998. (W: Weight in Metric Tonnes, N: Number of Units, R: Rupture of Units) Percentage (%): % share in trade**

# ANNEXURE 1.19

## SITC 87229
## Value in $'000'
## Netherlands Imports

| | | 1993 | | 1994 | | 1995 | | 1996 | | 1997 | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Country | Unit | Value | Quantity | Value | Quantity | Value | Quantity | Value | Quantity | Value | Quantity |
| **TOTAL WORLD** | **W** | **273,871** | **4,231** | **293,116** | **4,832** | **344,691** | **4,840** | **401,614** | **5,784** | **381,924** | **7,307** |
| | | | | | | | | | | | |
| USA,PR,USVI | W | 88,615 | 960 | 93,164 | 1,020 | 134,029 | 1,255 | 152,469 | 1,463 | 163,244 | 2,062 |
| | | 32.36% | 22.69% | 31.78% | 21.11% | 38.88% | 25.93% | 37.96% | 25.29% | 42.74% | 28.22% |
| GERMANY | W | 57,486 | 625 | 56,352 | 727 | 55,782 | 649 | 73,614 | 1,067 | 39,936 | 662 |
| | | 20.99% | 14.77% | 19.23% | 15.05% | 16.18% | 13.41% | 18.33% | 18.45% | 10.46% | 9.06% |
| IRELAND | W | 13,815 | 446 | 32,024 | 1,027 | 40,217 | 1,206 | 37,704 | 1,119 | 48,056 | 1,563 |
| | | 5.04% | 10.54% | 10.93% | 21.25% | 11.67% | 24.92% | 9.39% | 19.35% | 12.58% | 21.39% |
| BELGIUM-LUX | W | 26,788 | 532 | 31,134 | 573 | 32,512 | 509 | 30,166 | 437 | 27,148 | 472 |
| | | 9.78% | 12.57% | 10.62% | 11.86% | 9.43% | 10.52% | 7.51% | 7.56% | 7.11% | 6.46% |
| UNTD KINGDOM | W | 14,814 | 188 | 13,000 | 153 | 20,962 | 192 | 36,710 | 597 | 36,158 | 1,134 |
| | | 5.41% | 4.44% | 4.44% | 3.17% | 6.08% | 3.97% | 9.14% | 10.32% | 9.47% | 15.52% |
| SINGAPORE | W | 7,065 | 58 | 10,371 | 110 | 11,642 | 111 | 10,648 | 122 | 12,402 | 240 |
| | | 2.58% | 1.37% | 3.54% | 2.28% | 3.38% | 2.29% | 2.65% | 2.11% | 3.25% | 3.28% |
| FRANCE | W | 11,174 | 133 | 10,675 | 119 | 8,682 | 89 | 11,321 | 87 | 9,446 | 89 |
| | | 4.08% | 3.14% | 3.64% | 2.46% | 2.52% | 1.84% | 2.82% | 1.50% | 2.47% | 1.22% |
| SWEDEN | W | 11,351 | 299 | 10,279 | 271 | 4,449 | 70 | 7,222 | 85 | 8,094 | 121 |
| | | 4.14% | 7.07% | 3.51% | 5.61% | 1.29% | 1.45% | 1.80% | 1.47% | 2.12% | 1.66% |
| JAPAN | W | 14,003 | 109 | 5,452 | 72 | 8,072 | 70 | 6,043 | 61 | 5,302 | 105 |
| | | 5.11% | 2.58% | 1.86% | 1.49% | 2.34% | 1.45% | 1.50% | 1.05% | 1.39% | 1.44% |
| SWITZ.LIECHT | W | 3,780 | 21 | 6,196 | 46 | 6,934 | 68 | 6,750 | 45 | 8,434 | 104 |
| | | 1.38% | 0.50% | 2.11% | 0.95% | 2.01% | 1.40% | 1.68% | 0.78% | 2.21% | 1.42% |
| ITALY | W | 5,079 | 159 | 5,106 | 227 | 5,308 | 208 | 5,876 | 199 | 5,229 | 243 |
| | | 1.85% | 3.76% | 1.74% | 4.70% | 1.54% | 4.30% | 1.46% | 3.44% | 1.37% | 3.33% |
| DENMARK | W | 3,513 | 125 | 2,477 | 137 | 2,242 | 77 | 3,708 | 112 | 2,623 | 112 |
| | | 1.28% | 2.95% | 0.85% | 2.84% | 0.65% | 1.59% | 0.92% | 1.94% | 0.69% | 1.53% |
| KOREA REP. | W | 4,666 | 230 | 3,091 | 75 | 3,398 | 112 | 2,495 | 120 | 392 | 18 |
| | | 1.70% | 5.44% | 1.05% | 1.55% | 0.99% | 2.31% | 0.62% | 2.07% | 0.10% | 0.25% |
| ISRAEL | W | 1,590 | 24 | 1,867 | 24 | 451 | 4 | 5,122 | 41 | 4,619 | 66 |
| | | 0.58% | 0.57% | 0.64% | 0.50% | 0.13% | 0.08% | 1.28% | 0.71% | 1.21% | 0.90% |
| CANADA | W | 944 | 5 | 1,584 | 9 | 1,839 | 9 | 1,922 | 13 | 1,869 | 20 |
| | | 0.34% | 0.12% | 0.54% | 0.19% | 0.53% | 0.19% | 0.48% | 0.22% | 0.49% | 0.27% |

**Source: ITC Database PCTAS 1998. (W: Weight in Metric Tonnes, N: Number of Units, R: Rupture of Units) Percentage (%): % share in trade**

# ANNEXURE 1.20

## SITC 87229
## Value in $'000'
## Netherlands Exports

| | | 1993 | | 1994 | | 1995 | | 1996 | | 1997 | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Country** | **Unit** | **Value** | **Quantity** | **Value** | **Quantity** | **Value** | **Quantity** | **Value** | **Quantity** | **Value** | **Quantity** |
| **TOTAL WORLD** | **W** | **339,817** | **5,542** | **318,664** | **5,070** | **328,766** | **4,373** | **392,150** | **5,627** | **451,616** | **6,543** |
| | | | | | | | | | | | |
| GERMANY | W | 71,549 | 1,034 | 66,859 | 879 | 74,601 | 850 | 88,511 | 1,353 | 70,400 | 1,259 |
| | | 21.06% | 18.66% | 20.98% | 17.34% | 22.69% | 19.44% | 22.57% | 24.04% | 15.59% | 19.24% |
| FRANCE | W | 42,358 | 918 | 35,070 | 757 | 35,738 | 520 | 46,247 | 700 | 47,691 | 938 |
| | | 12.46% | 16.56% | 11.01% | 14.93% | 10.87% | 11.89% | 11.79% | 12.44% | 10.56% | 14.34% |
| BELGIUM-LUX | W | 41,372 | 732 | 37,039 | 586 | 31,159 | 482 | 42,520 | 647 | 32,941 | 607 |
| | | 12.17% | 13.21% | 11.62% | 11.56% | 9.48% | 11.02% | 10.84% | 11.50% | 7.29% | 9.28% |
| UNTD KINGDOM | W | 23,277 | 440 | 24,626 | 478 | 24,112 | 295 | 38,216 | 423 | 51,430 | 509 |
| | | 6.85% | 7.94% | 7.73% | 9.43% | 7.33% | 6.75% | 9.75% | 7.52% | 11.39% | 7.78% |
| ITALY | W | 28,114 | 357 | 30,064 | 394 | 23,479 | 273 | 27,813 | 371 | 26,820 | 433 |
| | | 8.27% | 6.44% | 9.43% | 7.77% | 7.14% | 6.24% | 7.09% | 6.59% | 5.94% | 6.62% |
| SPAIN | W | 19,817 | 494 | 18,033 | 366 | 21,270 | 327 | 23,284 | 374 | 23,248 | 466 |
| | | 5.83% | 8.91% | 5.66% | 7.22% | 6.47% | 7.48% | 5.94% | 6.65% | 5.15% | 7.12% |
| USA,PR,USVI | W | 19,171 | 113 | 14,846 | 108 | 20,499 | 134 | 17,448 | 96 | 24,344 | 130 |
| | | 5.64% | 2.04% | 4.66% | 2.13% | 6.24% | 3.06% | 4.45% | 1.71% | 5.39% | 1.99% |
| JAPAN | W | 9,195 | 42 | 3,392 | 18 | 4,691 | 11 | 2,070 | 19 | 57,314 | 28 |
| | | 2.71% | 0.76% | 1.06% | 0.36% | 1.43% | 0.25% | 0.53% | 0.34% | 12.69% | 0.43% |
| SWEDEN | W | 6,495 | 104 | 7,087 | 96 | 7,499 | 105 | 9,541 | 137 | 9,429 | 171 |
| | | 1.91% | 1.88% | 2.22% | 1.89% | 2.28% | 2.40% | 2.43% | 2.43% | 2.09% | 2.61% |
| AUSTRIA | W | 5,968 | 63 | 7,158 | 136 | 4,919 | 67 | 6,720 | 111 | 8,454 | 189 |
| | | 1.76% | 1.14% | 2.25% | 2.68% | 1.50% | 1.53% | 1.71% | 1.97% | 1.87% | 2.89% |
| SWITZ.LIECHT | W | 3,372 | 49 | 4,179 | 59 | 5,719 | 71 | 6,998 | 79 | 6,966 | 121 |
| | | 0.99% | 0.88% | 1.31% | 1.16% | 1.74% | 1.62% | 1.78% | 1.40% | 1.54% | 1.85% |
| GREECE | W | 5,822 | 116 | 4,348 | 84 | 5,026 | 86 | 6,349 | 98 | 4,624 | 104 |
| | | 1.71% | 2.09% | 1.36% | 1.66% | 1.53% | 1.97% | 1.62% | 1.74% | 1.02% | 1.59% |
| NORWAY | W | 2,411 | 23 | 2,230 | 28 | 2,985 | 37 | 3,780 | 49 | 7,255 | 107 |
| | | 0.71% | 0.42% | 0.70% | 0.55% | 0.91% | 0.85% | 0.96% | 0.87% | 1.61% | 1.64% |
| TURKEY | W | 4,086 | 43 | 2,048 | 27 | 2,949 | 59 | 2,389 | 43 | 4,616 | 52 |
| | | 1.20% | 0.78% | 0.64% | 0.53% | 0.90% | 1.35% | 0.61% | 0.76% | 1.02% | 0.79% |
| S.AFR.CUS.UN | W | 2,143 | 22 | 3,089 | 38 | 2,553 | 30 | 3,220 | 41 | 4,726 | 50 |
| | | 0.63% | 0.40% | 0.97% | 0.75% | 0.78% | 0.69% | 0.82% | 0.73% | 1.05% | 0.76% |

**Source: ITC Database PCTAS 1998. (W: Weight in Metric Tonnes, N: Number of Units, R: Rupture of Units) Percentage (%): % share in trade**

# ANNEXURE 1.21

## SITC 87229
## Value in $'000'
## Belgium Imports

| | | 1993 | | 1994 | | 1995 | | 1996 | | 1997 | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Country | Unit | Value | Quantity | Value | Quantity | Value | Quantity | Value | Quantity | Value | Quantity |
| **TOTAL WORLD** | **W** | **258,680** | **5,400** | **309,572** | **7,819** | **400,149** | **8,181** | **457,273** | **8,713** | **451,410** | **10,963** |
| | | | | | | | | | | | |
| USA,PR,USVI | W | 75,071 | 1,117 | 76,956 | 1,755 | 104,278 | 1,518 | 137,133 | 1,543 | 96,947 | 1,596 |
| | | 29.02% | 20.69% | 24.86% | 22.45% | 26.06% | 18.56% | 29.99% | 17.71% | 21.48% | 14.56% |
| NETHERLANDS | W | 46,102 | 859 | 44,992 | 765 | 58,812 | 1,277 | 58,539 | 876 | 63,244 | 1,052 |
| | | 17.82% | 15.91% | 14.53% | 9.78% | 14.70% | 15.61% | 12.80% | 10.05% | 14.01% | 9.60% |
| GERMANY | W | 39,138 | 677 | 43,746 | 897 | 47,394 | 879 | 51,660 | 1,009 | 43,520 | 1,057 |
| | | 15.13% | 12.54% | 14.13% | 11.47% | 11.84% | 10.74% | 11.30% | 11.58% | 9.64% | 9.64% |
| JAPAN | W | 12,085 | 172 | 28,039 | 656 | 39,849 | 842 | 47,422 | 995 | 57,327 | 1,231 |
| | | 4.67% | 3.19% | 9.06% | 8.39% | 9.96% | 10.29% | 10.37% | 11.42% | 12.70% | 11.23% |
| FRANCE | W | 20,850 | 559 | 17,479 | 495 | 26,365 | 432 | 38,588 | 895 | 46,640 | 1,545 |
| | | 8.06% | 10.35% | 5.65% | 6.33% | 6.59% | 5.28% | 8.44% | 10.27% | 10.33% | 14.09% |
| UNTD KINGDOM | W | 16,208 | 459 | 27,423 | 683 | 28,556 | 430 | 34,296 | 499 | 42,637 | 596 |
| | | 6.27% | 8.50% | 8.86% | 8.74% | 7.14% | 5.26% | 7.50% | 5.73% | 9.45% | 5.44% |
| MALTA | W | 0 | 0 | 12,233 | 590 | 36,638 | 1,452 | 29,154 | 1,382 | 27,409 | 1,983 |
| | | 0.00% | 0.00% | 3.95% | 7.55% | 9.16% | 17.75% | 6.38% | 15.86% | 6.07% | 18.09% |
| IRELAND | W | 15,751 | 731 | 25,312 | 1,140 | 14,090 | 449 | 16,126 | 548 | 26,805 | 555 |
| | | 6.09% | 13.54% | 8.18% | 14.58% | 3.52% | 5.49% | 3.53% | 6.29% | 5.94% | 5.06% |
| ITALY | W | 6,444 | 292 | 7,972 | 285 | 11,434 | 321 | 9,965 | 359 | 12,858 | 593 |
| | | 2.49% | 5.41% | 2.58% | 3.64% | 2.86% | 3.92% | 2.18% | 4.12% | 2.85% | 5.41% |
| DENMARK | W | 2,849 | 117 | 4,802 | 106 | 6,806 | 137 | 6,726 | 165 | 4,875 | 113 |
| | | 1.10% | 2.17% | 1.55% | 1.36% | 1.70% | 1.67% | 1.47% | 1.89% | 1.08% | 1.03% |
| SWEDEN | W | 5,041 | 125 | 4,952 | 157 | 3,075 | 61 | 5,861 | 79 | 6,332 | 82 |
| | | 1.95% | 2.31% | 1.60% | 2.01% | 0.77% | 0.75% | 1.28% | 0.91% | 1.40% | 0.75% |
| SWITZ.LIECHT | W | 4,109 | 26 | 3,534 | 24 | 5,291 | 19 | 4,866 | 17 | 5,604 | 25 |
| | | 1.59% | 0.48% | 1.14% | 0.31% | 1.32% | 0.23% | 1.06% | 0.20% | 1.24% | 0.23% |
| ISRAEL | W | 4,401 | 39 | 2,963 | 25 | 4,356 | 38 | 5,049 | 45 | 2,907 | 25 |
| | | 1.70% | 0.72% | 0.96% | 0.32% | 1.09% | 0.46% | 1.10% | 0.52% | 0.64% | 0.23% |
| PORTUGAL | W | 2,253 | 107 | 2,202 | 105 | 2,967 | 164 | 2,069 | 117 | 2,228 | 167 |
| | | 0.87% | 1.98% | 0.71% | 1.34% | 0.74% | 2.00% | 0.45% | 1.34% | 0.49% | 1.52% |
| NORWAY | W | 1,357 | 28 | 1,790 | 28 | 1,960 | 35 | 2,834 | 44 | 2,139 | 33 |
| | | 0.52% | 0.52% | 0.58% | 0.36% | 0.49% | 0.43% | 0.62% | 0.50% | 0.47% | 0.30% |

**Source: ITC Database PCTAS 1998. (W: Weight in Metric Tonnes, N: Number of Units, R: Rupture of Units) Percentage (%): % share in trade**

# ANNEXURE 1.22

## SITC 87229
## Value in $'000'
## Belgium Exports

| | | 1993 | | 1994 | | 1995 | | 1996 | | 1997 | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Country | Unit | Value | Quantity | Value | Quantity | Value | Quantity | Value | Quantity | Value | Quantity |
| **TOTAL WORLD** | **W** | **238,160** | **5,724** | **259,230** | **6,380** | **362,983** | **7,687** | **370,063** | **7,010** | **383,812** | **8,499** |
| | | | | | | | | | | | |
| FRANCE | W | 52,839 | 1,811 | 49,630 | 1,901 | 74,904 | 2,036 | 68,605 | 1,721 | 77,078 | 1,863 |
| | | 22.19% | 31.64% | 19.15% | 29.80% | 20.64% | 26.49% | 18.54% | 24.55% | 20.08% | 21.92% |
| GERMANY | W | 40,032 | 593 | 46,039 | 837 | 58,449 | 1,042 | 69,211 | 1,027 | 78,666 | 1,738 |
| | | 16.81% | 10.36% | 17.76% | 13.12% | 16.10% | 13.56% | 18.70% | 14.65% | 20.50% | 20.45% |
| NETHERLANDS | W | 39,260 | 933 | 41,485 | 869 | 57,263 | 845 | 55,646 | 815 | 49,819 | 835 |
| | | 16.48% | 16.30% | 16.00% | 13.62% | 15.78% | 10.99% | 15.04% | 11.63% | 12.98% | 9.82% |
| UNTD KINGDOM | W | 24,333 | 402 | 29,487 | 758 | 39,760 | 837 | 37,804 | 896 | 39,034 | 1,071 |
| | | 10.22% | 7.02% | 11.37% | 11.88% | 10.95% | 10.89% | 10.22% | 12.78% | 10.17% | 12.60% |
| ITALY | W | 18,596 | 410 | 22,838 | 460 | 35,413 | 675 | 41,457 | 781 | 40,279 | 932 |
| | | 7.81% | 7.16% | 8.81% | 7.21% | 9.76% | 8.78% | 11.20% | 11.14% | 10.49% | 10.97% |
| SPAIN | W | 9,143 | 259 | 14,863 | 341 | 22,449 | 527 | 24,018 | 516 | 22,305 | 636 |
| | | 3.84% | 4.52% | 5.73% | 5.34% | 6.18% | 6.86% | 6.49% | 7.36% | 5.81% | 7.48% |
| SWEDEN | W | 5,077 | 144 | 4,224 | 136 | 16,111 | 248 | 16,145 | 312 | 15,547 | 322 |
| | | 2.13% | 2.52% | 1.63% | 2.13% | 4.44% | 3.23% | 4.36% | 4.45% | 4.05% | 3.79% |
| USA,PR,USVI | W | 11,499 | 147 | 11,853 | 114 | 7,457 | 86 | 5,734 | 64 | 8,866 | 102 |
| | | 4.83% | 2.57% | 4.57% | 1.79% | 2.05% | 1.12% | 1.55% | 0.91% | 2.31% | 1.20% |
| AUSTRIA | W | 1,490 | 30 | 1,858 | 25 | 6,760 | 124 | 5,530 | 95 | 5,584 | 97 |
| | | 0.63% | 0.52% | 0.72% | 0.39% | 1.86% | 1.61% | 1.49% | 1.36% | 1.45% | 1.14% |
| GREECE | W | 2,007 | 40 | 3,044 | 50 | 4,427 | 54 | 5,055 | 82 | 5,037 | 94 |
| | | 0.84% | 0.70% | 1.17% | 0.78% | 1.22% | 0.70% | 1.37% | 1.17% | 1.31% | 1.11% |
| TURKEY | W | 1,474 | 43 | 1,895 | 22 | 4,613 | 61 | 1,341 | 19 | 8,833 | 182 |
| | | 0.62% | 0.75% | 0.73% | 0.34% | 1.27% | 0.79% | 0.36% | 0.27% | 2.30% | 2.14% |
| SWITZ.LIECHT | W | 1,804 | 27 | 2,029 | 21 | 3,844 | 266 | 4,366 | 95 | 3,869 | 43 |
| | | 0.76% | 0.47% | 0.78% | 0.33% | 1.06% | 3.46% | 1.18% | 1.36% | 1.01% | 0.51% |
| DENMARK | W | 1,995 | 74 | 1,986 | 52 | 1,972 | 36 | 1,968 | 16 | 1,759 | 21 |
| | | 0.84% | 1.29% | 0.77% | 0.82% | 0.54% | 0.47% | 0.53% | 0.23% | 0.46% | 0.25% |
| RUSSIAN FED | W | 1,089 | 4 | 2,455 | 32 | 2,499 | 40 | 1,242 | 23 | 1,799 | 75 |
| | | 0.46% | 0.07% | 0.95% | 0.50% | 0.69% | 0.52% | 0.34% | 0.33% | 0.47% | 0.88% |
| IRELAND | W | 1,639 | 174 | 1,301 | 102 | 2,185 | 148 | 1,134 | 30 | 2,043 | 56 |
| | | 0.69% | 3.04% | 0.50% | 1.60% | 0.60% | 1.93% | 0.31% | 0.43% | 0.53% | 0.66% |

**Source: ITC Database PCTAS 1998. (W: Weight in Metric Tonnes, N: Number of Units, R: Rupture of Units) Percentage (%): % share in trade**

# ANNEXURE 1.23

## SITC 87229
## Value in $'000'
## Singapore Imports

| | | 1993 | | 1994 | | 1995 | | 1996 | | 1997 | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Country | Unit | Value | Quantity | Value | Quantity | Value | Quantity | Value | Quantity | Value | Quantity |
| **TOTAL WORLD** | | **111,806** | **0** | **143,684** | **0** | **143,153** | **0** | **142,450** | **0** | **145,064** | **0** |
| | | | | | | | | | | | |
| USA,PR,USVI | | 59,297 | 0 | 81,743 | 0 | 74,839 | 0 | 78,056 | 0 | 78,487 | 0 |
| | | 53.04% | #DIV/0! | 56.89% | #DIV/0! | 52.28% | #DIV/0! | 54.80% | #DIV/0! | 54.11% | #DIV/0! |
| JAPAN | | 21,436 | 0 | 23,261 | 0 | 29,326 | 0 | 27,727 | 0 | 19,031 | 0 |
| | | 19.17% | #DIV/0! | 16.19% | #DIV/0! | 20.49% | #DIV/0! | 19.46% | #DIV/0! | 13.12% | #DIV/0! |
| GERMANY | | 9,120 | 0 | 12,625 | 0 | 10,530 | 0 | 10,615 | 0 | 9,203 | 0 |
| | | 8.16% | #DIV/0! | 8.79% | #DIV/0! | 7.36% | #DIV/0! | 7.45% | #DIV/0! | 6.34% | #DIV/0! |
| UNTD KINGDOM | | 3,008 | 0 | 4,403 | 0 | 4,810 | 0 | 5,195 | 0 | 10,609 | 0 |
| | | 2.69% | #DIV/0! | 3.06% | #DIV/0! | 3.36% | #DIV/0! | 3.65% | #DIV/0! | 7.31% | #DIV/0! |
| HONG KONG | | 1,695 | 0 | 1,988 | 0 | 3,012 | 0 | 2,543 | 0 | 2,819 | 0 |
| | | 1.52% | #DIV/0! | 1.38% | #DIV/0! | 2.10% | #DIV/0! | 1.79% | #DIV/0! | 1.94% | #DIV/0! |
| AUSTRALIA | | 2,935 | 0 | 1,776 | 0 | 1,447 | 0 | 1,671 | 0 | 1,684 | 0 |
| | | 2.63% | #DIV/0! | 1.24% | #DIV/0! | 1.01% | #DIV/0! | 1.17% | #DIV/0! | 1.16% | #DIV/0! |
| SWITZ.LIECHT | | 1,112 | 0 | 1,972 | 0 | 1,745 | 0 | 1,292 | 0 | 2,391 | 0 |
| | | 0.99% | #DIV/0! | 1.37% | #DIV/0! | 1.22% | #DIV/0! | 0.91% | #DIV/0! | 1.65% | #DIV/0! |
| MALAYSIA | | 2,502 | 0 | 1,093 | 0 | 946 | 0 | 1,200 | 0 | 2,064 | 0 |
| | | 2.24% | #DIV/0! | 0.76% | #DIV/0! | 0.66% | #DIV/0! | 0.84% | #DIV/0! | 1.42% | #DIV/0! |
| KOREA REP. | | 345 | 0 | 2,561 | 0 | 1,743 | 0 | 817 | 0 | 1,756 | 0 |
| | | 0.31% | #DIV/0! | 1.78% | #DIV/0! | 1.22% | #DIV/0! | 0.57% | #DIV/0! | 1.21% | #DIV/0! |
| FRANCE | | 2,114 | 0 | 1,085 | 0 | 1,030 | 0 | 847 | 0 | 1,371 | 0 |
| | | 1.89% | #DIV/0! | 0.76% | #DIV/0! | 0.72% | #DIV/0! | 0.59% | #DIV/0! | 0.95% | #DIV/0! |
| ITALY | | 1,308 | 0 | 1,164 | 0 | 1,629 | 0 | 1,109 | 0 | 1,172 | 0 |
| | | 1.17% | #DIV/0! | 0.81% | #DIV/0! | 1.14% | #DIV/0! | 0.78% | #DIV/0! | 0.81% | #DIV/0! |
| NETHERLANDS | | 924 | 0 | 925 | 0 | 1,562 | 0 | 862 | 0 | 1,589 | 0 |
| | | 0.83% | #DIV/0! | 0.64% | #DIV/0! | 1.09% | #DIV/0! | 0.61% | #DIV/0! | 1.10% | #DIV/0! |
| CANADA | | 257 | 0 | 1,079 | 0 | 666 | 0 | 1,830 | 0 | 1,957 | 0 |
| | | 0.23% | #DIV/0! | 0.75% | #DIV/0! | 0.47% | #DIV/0! | 1.28% | #DIV/0! | 1.35% | #DIV/0! |
| OTH.ASIA NES | | 1,202 | 0 | 738 | 0 | 1,379 | 0 | 738 | 0 | 967 | 0 |
| | | 1.08% | #DIV/0! | 0.51% | #DIV/0! | 0.96% | #DIV/0! | 0.52% | #DIV/0! | 0.67% | #DIV/0! |
| BELGIUM-LUX | | 289 | 0 | 635 | 0 | 384 | 0 | 1,541 | 0 | 1,582 | 0 |
| | | 0.26% | #DIV/0! | 0.44% | #DIV/0! | 0.27% | #DIV/0! | 1.08% | #DIV/0! | 1.09% | #DIV/0! |

**Source: ITC Database PCTAS 1998. (W: Weight in Metric Tonnes, N: Number of Units, R: Rupture of Units) Percentage (%): % share in trade**

# ANNEXURE 1.24

## SITC 87229
## Value in $'000'
## Singapore Exports

| | | 1993 | | 1994 | | 1995 | | 1996 | | 1997 | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Country | Unit | Value | Quantity | Value | Quantity | Value | Quantity | Value | Quantity | Value | Quantity |
| **TOTAL WORLD** | | **275,492** | **0** | **291,558** | **0** | **295,135** | **0** | **307,384** | **0** | **356,972** | **0** |
| | | | | | | | | | | | |
| USA,PR,USVI | | 115,152 | 0 | 118,412 | 0 | 109,524 | 0 | 122,683 | 0 | 113,677 | 0 |
| | | 41.80% | #DIV/0! | 40.61% | #DIV/0! | 37.11% | #DIV/0! | 39.91% | #DIV/0! | 31.84% | #DIV/0! |
| JAPAN | | 82,150 | 0 | 88,387 | 0 | 87,892 | 0 | 84,251 | 0 | 87,481 | 0 |
| | | 29.82% | #DIV/0! | 30.32% | #DIV/0! | 29.78% | #DIV/0! | 27.41% | #DIV/0! | 24.51% | #DIV/0! |
| AUSTRALIA | | 6,130 | 0 | 8,180 | 0 | 12,278 | 0 | 8,701 | 0 | 20,695 | 0 |
| | | 2.23% | #DIV/0! | 2.81% | #DIV/0! | 4.16% | #DIV/0! | 2.83% | #DIV/0! | 5.80% | #DIV/0! |
| OTH.ASIA NES | | 7,657 | 0 | 10,559 | 0 | 12,490 | 0 | 9,492 | 0 | 10,587 | 0 |
| | | 2.78% | #DIV/0! | 3.62% | #DIV/0! | 4.23% | #DIV/0! | 3.09% | #DIV/0! | 2.97% | #DIV/0! |
| KOREA REP. | | 9,593 | 0 | 10,022 | 0 | 9,501 | 0 | 6,353 | 0 | 15,221 | 0 |
| | | 3.48% | #DIV/0! | 3.44% | #DIV/0! | 3.22% | #DIV/0! | 2.07% | #DIV/0! | 4.26% | #DIV/0! |
| INDIA EX SIK | | 5,705 | 0 | 7,190 | 0 | 8,325 | 0 | 11,764 | 0 | 13,691 | 0 |
| | | 2.07% | #DIV/0! | 2.47% | #DIV/0! | 2.82% | #DIV/0! | 3.83% | #DIV/0! | 3.84% | #DIV/0! |
| THAILAND | | 7,723 | 0 | 7,913 | 0 | 8,776 | 0 | 6,917 | 0 | 9,324 | 0 |
| | | 2.80% | #DIV/0! | 2.71% | #DIV/0! | 2.97% | #DIV/0! | 2.25% | #DIV/0! | 2.61% | #DIV/0! |
| HONG KONG | | 5,010 | 0 | 6,659 | 0 | 5,434 | 0 | 8,312 | 0 | 14,154 | 0 |
| | | 1.82% | #DIV/0! | 2.28% | #DIV/0! | 1.84% | #DIV/0! | 2.70% | #DIV/0! | 3.97% | #DIV/0! |
| MALAYSIA | | 7,069 | 0 | 7,989 | 0 | 9,269 | 0 | 4,268 | 0 | 7,791 | 0 |
| | | 2.57% | #DIV/0! | 2.74% | #DIV/0! | 3.14% | #DIV/0! | 1.39% | #DIV/0! | 2.18% | #DIV/0! |
| CHINA | | 3,015 | 0 | 2,193 | 0 | 7,135 | 0 | 8,040 | 0 | 6,892 | 0 |
| | | 1.09% | #DIV/0! | 0.75% | #DIV/0! | 2.42% | #DIV/0! | 2.62% | #DIV/0! | 1.93% | #DIV/0! |
| NETHERLANDS | | 8,554 | 0 | 5,746 | 0 | 583 | 0 | 3,444 | 0 | 8,943 | 0 |
| | | 3.10% | #DIV/0! | 1.97% | #DIV/0! | 0.20% | #DIV/0! | 1.12% | #DIV/0! | 2.51% | #DIV/0! |
| PHILIPPINES | | 2,085 | 0 | 1,954 | 0 | 3,199 | 0 | 7,737 | 0 | 8,200 | 0 |
| | | 0.76% | #DIV/0! | 0.67% | #DIV/0! | 1.08% | #DIV/0! | 2.52% | #DIV/0! | 2.30% | #DIV/0! |
| BELGIUM-LUX | | 248 | 0 | 71 | 0 | 1,074 | 0 | 5,278 | 0 | 15,334 | 0 |
| | | 0.09% | #DIV/0! | 0.02% | #DIV/0! | 0.36% | #DIV/0! | 1.72% | #DIV/0! | 4.30% | #DIV/0! |
| COSTA RICA | | 0 | 0 | 0 | 0 | 3,711 | 0 | 4,127 | 0 | 5,275 | 0 |
| | | 0.00% | #DIV/0! | 0.00% | #DIV/0! | 1.26% | #DIV/0! | 1.34% | #DIV/0! | 1.48% | #DIV/0! |
| UNTD KINGDOM | | 930 | 0 | 1,600 | 0 | 2,794 | 0 | 3,581 | 0 | 2,710 | 0 |
| | | 0.34% | #DIV/0! | 0.55% | #DIV/0! | 0.95% | #DIV/0! | 1.16% | #DIV/0! | 0.76% | #DIV/0! |

**Source: ITC Database PCTAS 1998. (W: Weight in Metric Tonnes, N: Number of Units, R: Rupture of Units) Percentage (%): % share in trade**

# ANNEXURE 1.25

## SITC 87219
## Value in $'000'
## Pakistan Exports

| | | 1993 | | 1994 | | 1995 | | 1996 | | 1997 | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Country | Unit | Value | Quantity | Value | Quantity | Value | Quantity | Value | Quantity | Value | Quantity |
| **TOTAL WORLD** | **N** | **3,751** | **1,732,051** | **2,818** | **1,610,680** | **2,109** | **1,145,810** | **2,219** | **1,252,166** | **2,708** | **1,688,568** |
| | | | | | | | | | | | |
| USA,PR,USVI | N | 691 | 363,965 | 516 | 347,163 | 224 | 139,723 | 282 | 139,788 | 274 | 222,516 |
| | | 18.42% | 21.01% | 18.31% | 21.55% | 10.62% | 12.19% | 12.71% | 11.16% | 10.12% | 13.18% |
| JAPAN | N | 435 | 169,494 | 390 | 282,130 | 250 | 156,035 | 284 | 136,550 | 211 | 108,862 |
| | | 11.60% | 9.79% | 13.84% | 17.52% | 11.85% | 13.62% | 12.80% | 10.91% | 7.79% | 6.45% |
| GERMANY | N | 348 | 152,444 | 158 | 80,813 | 220 | 97,397 | 349 | 190,799 | 285 | 157,786 |
| | | 9.28% | 8.80% | 5.61% | 5.02% | 10.43% | 8.50% | 15.73% | 15.24% | 10.52% | 9.34% |
| ITALY | N | 254 | 137,605 | 152 | 76,492 | 165 | 66,164 | 308 | 182,900 | 228 | 128,269 |
| | | 6.77% | 7.94% | 5.39% | 4.75% | 7.82% | 5.77% | 13.88% | 14.61% | 8.42% | 7.60% |
| UNTD KINGDOM | N | 58 | 55,903 | 120 | 65,426 | 97 | 35,668 | 108 | 61,136 | 130 | 53,757 |
| | | 1.55% | 3.23% | 4.26% | 4.06% | 4.60% | 3.11% | 4.87% | 4.88% | 4.80% | 3.18% |
| ARGENTINA | N | 88 | 52,740 | 176 | 89,314 | 28 | 13,700 | 47 | 44,075 | 164 | 142,485 |
| | | 2.35% | 3.04% | 6.25% | 5.55% | 1.33% | 1.20% | 2.12% | 3.52% | 6.06% | 8.44% |
| FRANCE | N | 77 | 25,672 | 84 | 19,091 | 132 | 36,079 | 62 | 22,700 | 137 | 49,312 |
| | | 2.05% | 1.48% | 2.98% | 1.19% | 6.26% | 3.15% | 2.79% | 1.81% | 5.06% | 2.92% |
| KOREA REP. | N | 291 | 84,462 | 0 | 0 | 40 | 26,620 | 45 | 20,380 | 63 | 39,880 |
| | | 7.76% | 4.88% | 0.00% | 0.00% | 1.90% | 2.32% | 2.03% | 1.63% | 2.33% | 2.36% |
| SINGAPORE | N | 157 | 55,114 | 17 | 4,119 | 74 | 49,480 | 86 | 52,402 | 64 | 55,339 |
| | | 4.19% | 3.18% | 0.60% | 0.26% | 3.51% | 4.32% | 3.88% | 4.18% | 2.36% | 3.28% |
| TURKEY | N | 151 | 81,764 | 77 | 83,650 | 58 | 61,864 | 29 | 40,556 | 63 | 66,032 |
| | | 4.03% | 4.72% | 2.73% | 5.19% | 2.75% | 5.40% | 1.31% | 3.24% | 2.33% | 3.91% |
| OTH.ASIA NES | N | 159 | 63,835 | 16 | 6,974 | 89 | 61,610 | 25 | 17,532 | 72 | 45,736 |
| | | 4.24% | 3.69% | 0.57% | 0.43% | 4.22% | 5.38% | 1.13% | 1.40% | 2.66% | 2.71% |
| MEXICO | N | 72 | 43,800 | 105 | 61,799 | 40 | 17,900 | 0 | 0 | 67 | 29,500 |
| | | 1.92% | 2.53% | 3.73% | 3.84% | 1.90% | 1.56% | 0.00% | 0.00% | 2.47% | 1.75% |
| ECUADOR | N | 42 | 25,687 | 87 | 30,347 | 15 | 6,726 | 45 | 21,195 | 51 | 17,110 |
| | | 1.12% | 1.48% | 3.09% | 1.88% | 0.71% | 0.59% | 2.03% | 1.69% | 1.88% | 1.01% |
| COLOMBIA | N | 26 | 10,982 | 73 | 28,920 | 80 | 43,677 | 2 | 1,750 | 49 | 26,700 |
| | | 0.69% | 0.63% | 2.59% | 1.80% | 3.79% | 3.81% | 0.09% | 0.14% | 1.81% | 1.58% |
| PHILIPPINES | N | 7 | 5,800 | 82 | 48,003 | 41 | 19,739 | 63 | 44,820 | 23 | 22,094 |
| | | 0.19% | 0.33% | 2.91% | 2.98% | 1.94% | 1.72% | 2.84% | 3.58% | 0.85% | 1.31% |

**Source: ITC Database PCTAS 1998. (W: Weight in Metric Tonnes, N: Number of Units, R: Rupture of Units) Percentage (%): % share in trade**

# ANNEXURE 1.26

## SITC 87229
## Value in $'000'
## Pakistan Exports

| | | 1993 | | 1994 | | 1995 | | 1996 | | 1997 | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Country | Unit | Value | Quantity | Value | Quantity | Value | Quantity | Value | Quantity | Value | Quantity |
| **TOTAL WORLD** | **N** | **101,972** | **80,102,192** | **94,029** | **65,575,824** | **108,102** | **75,750,672** | **135,374** | **92,798,224** | **131,409** | **96,117,552** |
| | | | | | | | | | | | |
| USA,PR,USVI | N | 56,663 | 52,064,896 | 44,983 | 36,700,656 | 51,510 | 43,784,336 | 58,764 | 48,157,616 | 57,822 | 51,611,488 |
| | | 55.57% | 65.00% | 47.84% | 55.97% | 47.65% | 57.80% | 43.41% | 51.89% | 44.00% | 53.70% |
| GERMANY | N | 13,230 | 7,101,226 | 13,174 | 6,830,165 | 12,322 | 6,121,478 | 20,738 | 9,804,038 | 17,403 | 8,785,881 |
| | | 12.97% | 8.87% | 14.01% | 10.42% | 11.40% | 8.08% | 15.32% | 10.56% | 13.24% | 9.14% |
| UNTD KINGDOM | N | 6,487 | 3,956,870 | 6,640 | 3,893,258 | 7,811 | 3,934,254 | 8,750 | 5,208,356 | 8,199 | 5,069,389 |
| | | 6.36% | 4.94% | 7.06% | 5.94% | 7.23% | 5.19% | 6.46% | 5.61% | 6.24% | 5.27% |
| FRANCE | N | 3,728 | 2,007,822 | 2,913 | 1,750,079 | 3,184 | 1,849,524 | 4,431 | 2,410,648 | 4,546 | 2,690,321 |
| | | 3.66% | 2.51% | 3.10% | 2.67% | 2.95% | 2.44% | 3.27% | 2.60% | 3.46% | 2.80% |
| ITALY | N | 1,711 | 944,613 | 1,927 | 991,025 | 2,390 | 1,585,766 | 4,877 | 3,281,949 | 4,837 | 3,262,605 |
| | | 1.68% | 1.18% | 2.05% | 1.51% | 2.21% | 2.09% | 3.60% | 3.54% | 3.68% | 3.39% |
| JAPAN | N | 1,565 | 978,675 | 2,303 | 1,214,570 | 3,111 | 1,787,437 | 4,058 | 2,407,584 | 3,682 | 1,867,594 |
| | | 1.53% | 1.22% | 2.45% | 1.85% | 2.88% | 2.36% | 3.00% | 2.59% | 2.80% | 1.94% |
| NETHERLANDS | N | 1,233 | 874,802 | 2,997 | 1,239,772 | 2,554 | 1,140,340 | 2,303 | 1,258,285 | 1,607 | 1,408,712 |
| | | 1.21% | 1.09% | 3.19% | 1.89% | 2.36% | 1.51% | 1.70% | 1.36% | 1.22% | 1.47% |
| DENMARK | N | 1,140 | 636,031 | 1,578 | 899,616 | 3,944 | 1,643,688 | 2,490 | 1,470,538 | 1,413 | 982,779 |
| | | 1.12% | 0.79% | 1.68% | 1.37% | 3.65% | 2.17% | 1.84% | 1.58% | 1.08% | 1.02% |
| AUSTRALIA | N | 1,120 | 1,193,060 | 1,338 | 1,562,614 | 1,439 | 1,719,367 | 2,168 | 1,979,496 | 2,131 | 2,024,442 |
| | | 1.10% | 1.49% | 1.42% | 2.38% | 1.33% | 2.27% | 1.60% | 2.13% | 1.62% | 2.11% |
| BRAZIL | N | 588 | 275,475 | 973 | 565,546 | 1,884 | 1,136,175 | 2,403 | 1,378,239 | 2,328 | 1,465,995 |
| | | 0.58% | 0.34% | 1.03% | 0.86% | 1.74% | 1.50% | 1.78% | 1.49% | 1.77% | 1.53% |
| KOREA REP. | N | 828 | 590,467 | 942 | 763,391 | 933 | 599,951 | 1,269 | 1,033,979 | 1,611 | 1,276,876 |
| | | 0.81% | 0.74% | 1.00% | 1.16% | 0.86% | 0.79% | 0.94% | 1.11% | 1.23% | 1.33% |
| SAUDI ARABIA | N | 920 | 701,766 | 1,296 | 807,718 | 1,363 | 957,452 | 983 | 669,589 | 925 | 631,524 |
| | | 0.90% | 0.88% | 1.38% | 1.23% | 1.26% | 1.26% | 0.73% | 0.72% | 0.70% | 0.66% |
| CANADA | N | 752 | 946,172 | 765 | 819,449 | 1,025 | 914,834 | 1,009 | 960,736 | 1,889 | 970,279 |
| | | 0.74% | 1.18% | 0.81% | 1.25% | 0.95% | 1.21% | 0.75% | 1.04% | 1.44% | 1.01% |
| SPAIN | N | 816 | 774,949 | 598 | 520,029 | 793 | 638,858 | 1,364 | 1,015,795 | 1,380 | 1,332,180 |
| | | 0.80% | 0.97% | 0.64% | 0.79% | 0.73% | 0.84% | 1.01% | 1.09% | 1.05% | 1.39% |
| UNTD ARAB EM | N | 404 | 271,811 | 382 | 275,441 | 541 | 576,456 | 1,647 | 1,165,068 | 1,602 | 1,338,057 |
| | | 0.40% | 0.34% | 0.41% | 0.42% | 0.50% | 0.76% | 1.22% | 1.26% | 1.22% | 1.39% |

**Source: ITC Database PCTAS 1998. (W: Weight in Metric Tonnes, N: Number of Units, R: Rupture of Units) Percentage (%): % share in trade**

| List of Machines Required for Surgical Instrument Manufacturing | | | |
|---|---|---|---|
| Prices | | | |
| | Local | Imported (New) | Imported (2nd Hand) |
| Hacksaw | | | |
| Spark Erosion Machine | | | |
| CNC Wire Cut Machine | | | |
| Shapers | | | |
| Copy Milling Machine | | | |
| Surface Grinding Machine | | | |
| Metal Shearing Press | | | |
| Eccentric Press (Blanking) | | | |
| Forging Furnace | | | |
| Drop Forging Hammer | | | |
| Annealing Furnace | | | |
| Eccentric Press (Trimming) | | | |
| Eccentric Press (Stamping) | | | |
| Shot Balsting Machine | | | |
| Milling Machine (Different Types) | | | |
| Lathe Machine | | | |
| Drill Machine | | | |
| Heat Treatment Furnace (Conventional) | | | |
| Heat Treatment Furnace (Vacuum) | | | |
| Rock Well Hardness Testing Machine | | | |
| Polishing Machine | | | |
| Grinding Machine | | | |
| Polishing Belt Machine | | | |
| Electro Plating Equipment | | | |
| Boil Test Bath | | | |
| Ultra-Sonic Cleaning Machine | | | |
| Electric Etching Machine | | | |
| Others (Vernier Calliper, etc) | | | |

**Exhibit 2**
**Imported Raw Material Used In Surgical Instrument Manufacturing and Tariff**

| Raw Material | Custom Duty (Ad Val) | Sales Tax |
|---|---|---|
| Flat Rolled Stainless Steel Sheets and Strips (AISI 410 & 420) | 25% | 15% |
| Hot Rolled Stainless Steel Bars | 15% | 15% |
| Electroplating Polishes Compositions and Salts | 45% | 15% |
| Grinding Belts | 45% | 15% |
| Emery Powder | 35% | 15% |
| Emery Grains | 35% | 15% |
| Electropolishing Chemicals | 15% | 15% |
| Trichloroethylene | 10% | 15% |
| Felt Mops | 25% | 15% |
| Satin Finishinhg Wheels | 45% | 15% |
| Granules and Flakes from Gloss Powder | 45% | 15% |
| Grinding Wheels | 25% | 15% |

**Exhibit 3**
**Disposable Procedure Kits**

**Suture Removal Kit**

**General Purpose Kit**

**Minor Procedure Kit**

**Major Laceration Kit**

**Exhibit 4**
**Price Comparison between German(Branded) and Pakistani Instrument**

| **Type of Instrument** | **Prices of German Branded Instrument (Aesculap) US $** | **Price of Pakistani Instrument US $** |
|---|---|---|
| Hook Retractors | 11 | 1.2 |
| Sheet Metal Retractors | 20 | 2.5 |
| Cat Paw Retractor | 32 | 3.3 |
| Needle Holders | 41 | 3 |
| Nasal Speculum | 65 | 5 |
| Self Retaining Retractors | 73 | 10 |
| Gall Stone Forceps | 88 | 4.3 |
| Intestinal Clamps | 84 | 7.5 |
| Rectal Speculum | 91 | 6.5 |
| Bone Holding Forceps | 108 | 11 |
| Abdominal Retractors | 191 | 27 |
| Bone Cutter | 201 | 24 |
| Outlet Forceps | 306 | 23 |
| Ribs Spreader | 388 | 45 |
| Rectal Biopsy Forceps | 459 | 38 |