

**Commissioner of Industries  
Hyderabad  
Andhra Pradesh**

## **Microwave Components**

### **1. Introduction**

The Department of Telecommunications has a significantly large expansion plan for telecommunication network to provide both digital & analog transmission & receiving facilities and the plan envisages expanding the network to rural areas also to provide good communication facilities. Also linking of the network to global communication network through satellite is taken up which requires large no. of switching equipment & systems at microwave frequencies for quality transmission & reception of the data. This requires a wide range of switching subassemblies & components. The switching equipment required includes 30/120 channel communication switching system operating at 2 Giga hertz(GHz) and other multi-channel communication switching systems for higher frequencies. The components required include diplexers, isolators, circulators and power dividers/splitters. The diplexers, isolators & circulators are useful in power flow as per requirement in prefixed directions only avoiding power flow in unwanted directions and the power dividers / splitters are useful in controlling the flow of power of prefixed magnitude only in a given direction.

The microwave components are manufactured using hard ferrites of microwave frequency, microwave frequency cables & metal components. The dimensions of all the components & cables are very critical at microwave frequency range, and hence, are to be controlled with micron accuracy.

### **II. Market Status & Scope**

The actual users of the microwave components are the manufacturers of switching & transmission equipment at microwave frequencies for telecommunication facilities in the country. There are 15 manufacturers in India manufacturing switching & transmission systems.

These fifteen manufacturers are manufacturing switching & transmission equipment of a wide range of specifications for various applications. The specifications of microwave components required by them vary widely and the components are to be fabricated with precision to suit the need of each manufacturer for each application.

According to the Department of Electronics & Department of Telecommunications, the expansion of telecommunication network is taken up on a large scale requiring about 400,000 components annually. About 20% of the requirement is met indigenously and the balance 80% of requirement is met through imports spending huge volume of foreign exchange. The indigenization of these microwave components by 100% results in import substitution & saving in foreign exchange of significant magnitude.

There are 20 manufacturers in India manufacturing microwave components of selective types & specifications.

### **III. Installed Capacity**

The proposed unit is for the manufacture of diplexers and isolators with an installed capacity of 3500 nos totally including 1500 diplexers and 2000 isolators annually on one shift basis. The suggested operating capacities are 60% in I year to produce 900 diplexers & 1200 isolators, 70% in II year to produce 1050 diplexers & 1400 isolators and 80% from III year onwards to produce 1200 diplexers & 1600 isolators.

#### IV. Manufacturing Process

The process includes computer aided designing of the components, fabrication of the parts of components using radio frequency strip line circuit using photo lithographic technique, fabrication of housing using aluminium or brass depending upon application, assembly of the components including mechanical housing, substrate material, control circuit board & external connections. After mounting the substrate into the housing, passive & active components are connected. The components after completing assembly are subjected to testing of technical specifications under specified controlled atmosphere as per the customer's requirement.

#### V. Land & Buildings

The project can be housed in rented/leased premises of about 1200 sq ft. A monthly rent of Rs.5,000/- is considered in working out the economics.

#### VI. Plant & Machinery

The required machinery & equipment is given below:

##### Machinery Equipment Required

| S.No          | Details                               | No. | Price     | Total     |
|---------------|---------------------------------------|-----|-----------|-----------|
| I.            | <b>Imported Equipment</b>             |     |           |           |
| 1.            | Radio frequency network analyser      | 1   | 25,00,000 | 25,00,000 |
| 2.            | Radio frequency spectrum analyser     | 1   | 10,00,000 | 10,00,000 |
| Sub Total - 1 |                                       |     |           | 35,00,000 |
| II.           | <b>Indigenous Equipment</b>           |     |           |           |
| 1.            | Transmission measuring equipment      | 1   | 18,000    | 18,000    |
| 2.            | Microwave power supplies              | 2   | 14,000    | 28,000    |
| 3.            | 20 M H2 dual track Oscilloscope       | 1   | 22,000    | 22,000    |
| 4.            | I.C tester                            | 1   | 6,000     | 6,000     |
| 5.            | Automatic LCR meter                   | 1   | 23,000    | 23,000    |
| 6.            | Digital multimeters                   | 4   | 6,000     | 24,000    |
| 7.            | 5 KVA servo controlled stabiliser     | 1   | 14,000    | 14,000    |
| 8.            | Environmental test chamber            | 1   | 2,70,000  | 2,70,000  |
| 9.            | Return loss bridge                    | 1   | 9,000     | 9,000     |
| 10.           | Test jigs to test hybrid transformers | 2   | 5,000     | 10,000    |
| 11.           | Radio frequency attenuators           | 5   | 7,000     | 35,000    |
| 12.           | Temperature controlled work stations  | 5   | 5,000     | 25,000    |

|                                         |                                                                                                                                                                                           |               |       |           |
|-----------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|-------|-----------|
| 13.                                     | Radio frequency terminations                                                                                                                                                              | 4             | 4,000 | 16,000    |
| Sub Total - 2                           |                                                                                                                                                                                           |               |       | 5,00,000  |
| Sub Total - 3                           |                                                                                                                                                                                           |               |       | 40,00,000 |
| Contingencies 10% on                    |                                                                                                                                                                                           | Sub Total - 3 |       | 4,00,000  |
| Sub Total - 4                           |                                                                                                                                                                                           |               |       | 44,00,000 |
| <b>III.</b>                             | <b>Miscellaneous Assets</b>                                                                                                                                                               |               |       |           |
| 1.                                      | Workshop equipment including bench grinder (1 No.), hot air oven (1 No.), bench lathe (1 No.) painting oven (1 No), plating equipment, drilling m/c portable (1 No) & standard hand tools | LS            |       | 2,50,000  |
| 2.                                      | Storage racks & bins LS                                                                                                                                                                   |               |       | 30,000    |
| 3.                                      | Assembly tools LS                                                                                                                                                                         |               |       | 40,000    |
| 4.                                      | Tables, chairs & office equipment LS                                                                                                                                                      |               |       | 1,80,000  |
| Sub total 5                             |                                                                                                                                                                                           |               |       | 5,00,000  |
| Grand total (sub total 4 + sub total 5) |                                                                                                                                                                                           |               |       | 49,00,000 |

### VII. Raw Materials

The required raw materials are hard ferrites in microwave frequency range, RF strip lines, metals (aluminium & brass) for housing, substrates, control circuit components like ICS & passive components, solder & hardware. Except hard ferrites, all the raw materials are available indigenously.

The bill of materials per annum in III year at 80% of capacity utilisation is as follows:

| S.No. | Raw material  | Cost per piece Rs. | Total No. | Total CostRs. lakhs |
|-------|---------------|--------------------|-----------|---------------------|
| 1.    | For duplexers | 4800               | 1200      | 57.60               |
| 2.    | For isolators | 2400               | 1600      | 38.40               |
| 3.    | Solder etc.   | L.S                | L.S       | 1.00                |
| Total |               |                    |           | 97.00               |

### VIII. Utilities

The project requires 5.0 HP of power and water for drinking & sanitary use. The annual costs towards utilities work out to Rs.0.18 lakh from III year onwards.

### IX. Manpower Requirement

The details of costs towards wages & salaries in III year are as follows:

| S.No.                                 | Details             | Number | Salary per month in I year | Total Rs. lakhs |
|---------------------------------------|---------------------|--------|----------------------------|-----------------|
| 1.                                    | Managers            | 2      | 9000                       | 2.16            |
| 2.                                    | Engineers           | 8      | 7000                       | 6.72            |
| 3.                                    | Accountant          | 1      | 4000                       | 0.48            |
| 4.                                    | Marketing Officers  | 2      | 4000                       | 0.96            |
| 5.                                    | Typist              | 1      | 2500                       | 0.30            |
| 6.                                    | Skilled workers     | 10     | 3000                       | 3.60            |
| 7.                                    | Semiskilled workers | 10     | 2000                       | 2.40            |
| 8.                                    | Unskilled workers   | 3      | 1500                       | 0.54            |
| 9.                                    | Watchmen            | 2      | 1500                       | 0.36            |
|                                       |                     |        |                            | 17.52           |
| Fringe benefit @ 20% + 5% annual rise |                     |        |                            | 5.48            |
| Total                                 |                     |        |                            | 23.00           |

#### X. Working Capital Requirement

The total working capital requirement including two months stock of raw materials, one month stock of packing material, one month's requirement of utilities, two months' salaries, one week's finished stock and two months' bills receivable works out to Rs. 54.15 lakhs in III year at 80% capacity utilisation.

#### XI. Preliminary & Pre-operative Expenses:

The preliminary and pre-operative expenses towards project report, acquiring loan, protomodels development, traveling, salaries, interest, trial production and contingencies amount to Rs.14.98 lakhs.

#### XII. Project Cost & Means of Finance (III year)

|                                                          |           |
|----------------------------------------------------------|-----------|
| I. Project Cost                                          | Rs. lakhs |
| a) Land                                                  | -         |
| b) Building                                              | Rented    |
| c) Machinery & equipment                                 | 44.00     |
| d) Miscellaneous fixed assets                            | 5.00      |
| e) Preliminary & preoperative expenses including deposit | 15.03     |
| Total fixed capital                                      | 64.03     |
| f) Working capital margin                                | 16.42     |
| Total project cost                                       | 80.45     |

|                         |       |
|-------------------------|-------|
| II. Means of Finance    |       |
| Promoter's contribution | 41.08 |
| Term loan               | 39.37 |

### XIII. Annual Operating Results (at 80 % capacity utilisation in III year)

|                                                           |        |
|-----------------------------------------------------------|--------|
| Rs. lakhs                                                 |        |
| A. Cost of Production                                     |        |
| a. Rent/lease                                             | 0.60   |
| b. Raw materials                                          | 97.00  |
| c. Utilities                                              | 0.18   |
| d. Salaries                                               | 23.00  |
| e. Packing materials                                      | 0.37   |
| f. Repairs, maintenance, insurance                        | 1.37   |
| g. Depreciation                                           | 2.26   |
| h. Telephone & post                                       | 3.74   |
| i. Selling expenses                                       | 9.84   |
| j. Preliminary & preoperative expenses written off        | 1.50   |
| k. Interest                                               | 12.00  |
| l. Administrative overheads                               | 6.64   |
| Total                                                     | 158.50 |
| B. Net sales                                              | 180.00 |
| C. Profit before tax                                      | 21.50  |
| D. Break even point (% of installed capacity)             | 47.5%  |
| E. DSCR                                                   | 2.30   |
| F. Cumulative cash surplus (by the end of V yr.)          | 107.30 |
| G. Rate of returns on promoters contribution before taxes | 52.3%  |

### XIV. List of some of Raw Material Suppliers

1. TDK Corpn. of America  
1600 Feehanville Dr. MT. Prospect  
Illinois 60050
2. Thomson- CSF Electron Tube Division  
550 Mount Pleasant Av.  
Dover, New Jersey - 07801

3. Bharat Electronics Ltd.,  
Jalahalli, Bangalore

4. Pieco Electricals & Electronics  
Bombay

**XV. List of Machinery Suppliers:**

1. Aplab Limited  
A1-A3-A5 wagle Indl, Estate,  
Thane-400 604.

2. Electronics Corpoation of India Ltd.,  
ECIL Post  
Cherlapalli  
Hyderabad - 500 762

3. Hewlett Packard Industries Ltd.  
Hyderabad.