CHAPTER-1

INTRODUCTION

1.1 ENERGY SECTOR

The term energy is derived from the Greek word ‘Energia’. Energy is defined as the capacity of a body to do work. Energy is one of the vital factors for economic growth. In modern days, energy is considered as a factor of production like land, labour, capital and organization. Consumption of energy is one of the key indicators of the development of a country. Various studies have proved that there is a direct relationship between the energy and economic growth.

Energy sources are classified according to their characteristics and consumption pattern\(^1\). Energy resources can be classified into primary and secondary energy resources. Nuclear energy, hydro energy, solar and wind energy come under the category of the primary energy resources, whereas refined fuels

such as gasoline, fuel oil, electricity, etc., are the secondary resources.

Further, the sources of energy can also be classified into commercial and non-commercial energy resources. All the commercial energy items such as petroleum, electricity, coal, etc., are economic goods but the non-commercial items like firewood, vegetable wastes, dried dung may be called free goods to some extent in rural areas. Usually, commercial energy resources are non-renewable but many items of non-commercial resources are renewable by nature.

Coal is the dominant commercial fuel in India, satisfying more than half of India’s energy demand. Power generation accounts for about 70 per cent of India’s coal consumption, followed by heavy industry. Coal consumption is projected to increase to 430 million short tons (Mmst) in 2010, up from 359 million short tons (Mmst) in 2000, India is the world’s third largest coal producer (after China and the United States). So domestic supplies satisfy most of the country’s coal demand. Indian coal generally has a high ash content and low calorific value. So most
Coking coal must be imported. Major Indian coal fields are found in Bihar, West Bengal, and Madhya Pradesh.

Oil is the most commercial energy source. As it is well known, around 40 percent of the energy needs of the world are fed by oil. As far as India is concerned, its reserves of oil are exceedingly low while compared to coal\(^2\). Oil accounts for about 30 per cent of India’s total energy consumption. The majority of India’s roughly 5.4 billion barrels in oil reserves are located in the Mumbai High, Upper Assam, Cambay, Krishna-Godavari, and Cauvery basins. The offshore Mumbai High field is by far India’s largest producing field, with current output of around 260,000 barrels per day (bbl/d). India’s average oil production level (total liquids) for 2003 is 819,000 bbl/d, of which 660,000 bbl/d is crude oil. India had net oil imports of over 1.4 million bbl/d in 2003. Future oil consumption in India is expected to grow rapidly, to 2.8 million bbl/d by 2010, from 2.2 million bbl/d in 2003.

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The gas industry plays a role of predominant significance in the growth of the energy sector of the country. Natural gas is generally used in gas-based power projects and also by the fertilizer sector as feedback in the manufacturing process. Further, it is being used as fuel by the transport sector. In the industrial sector, it is used as an eco-friendly fuel. Indian consumption of natural gas has risen faster than any other fuel in recent years from only 0.6 trillion cubic feet (Tcf) per year in 1995, natural gas use is nearly 0.9 Tcf in 2002 and is projected to reach 1.2 Tcf in 2010 and 1.6 Tcf in 2015.

From the reports of Reliance Industries and its discovery, new reserves are estimated at about 7 Tcf in the Krishna - Godavari basin, 1 Tcf in the off shores of Orissa and the reserves of 2 Tcf are estimated in the off Shores of Andra Pradesh as well as Gujarat. Even with these new reserves, India’s domestic natural gas supply is not likely to keep pace with demand, and the country will have to import much of its natural gas, either via pipeline or as Liquefied Natural Gas (LNG). Most of India’s current natural gas production takes place in the Mumbai High basin and the state of Gujarat.
Electricity is a renewable source of commercial energy. It is eco-friendly.\textsuperscript{3} India is trying to expand electric power generation capacity, as current generation is seriously below peak demand. Although about 80 per cent of the population has access to electricity, power short are common, and the unreliability of electricity supplies is severe enough to constitute a constraint on the country’s overall economic development. The government had targeted capacity increases totaling 100,000 megawatts (MW) over the next ten years. As of January 2002, total installed Indian power generating capacity is 120,000 MW.

Cow dung, fuel wood, agriculture and animal wastes and drought animal power are called as non-commercial energy sources. Because their production, distribution and consumption do not strictly pass through the commercial and monetized channels of exchange. Agricultural wastes are generally referred to as biomass and they include husks, stem, branches, twigs, bark, shrubs, dry leaves, spadix, rice bran, wastes from canning and processing units. These sources have been continuous and abundant in India.

India has above 375 hundred million heads of cattle and they produce over 700 million tonnes of fresh dung every year. Most of it is dried and burnt as fuel. One tonne of dried dung is equivalent of about .004 tonne of coal in heating value. It has thus been an excellent source of fuel for the Indian masses for centuries. More recent studies estimated that traditional biomass fuels- firewood, agro - residues and animal waste meet between 1/3 and 1/2 of India’s total energy needs and non-commercial energy provide more than 3/4 of all households needs.

Solar Energy is most readily available source of energy. Solar energy has been identified as the most useful conventional and eco-friendly energy source. It is also the most important non-conventional sources of energy. Because it is non-polluting and therefore helps in lessening the green house effect. It is usually available to mankind in the form of light and heat. It has a wide variety of uses, which include heating, cooking, drying water purification and the like. It could also be used for electricity generation through solar photovoltaic route. It operates on the conversation of sunlight to DC electricity. The electrical energy thus produced is either used directly or stored in batteries for later
The use of Solar Photo Voltaic (SPV) has been well accepted in rural electrification applications.

The solar energy can be broadly classified in two categories on the basis of its use - Solar Active (Direct Use) and Solar Passive (Indirect Use). In Solar Active category, the solar energy is directly converted in the application form and can be further divided into two forms - Solar Thermal (Heating Application) and Solar Photovoltaic (Electricity Generation). One major highlight, the first in India and amongst the largest in the world, is the 140 MW Integrated Solar Combined Cycle (ISCC) with a solar thermal component of 35 MW power project at Mathiana near Jodhpur in Rajasthan is under execution. India receives 5,000 trillion KWh of solar energy annually, and is characterized by 230-300 sunny days in a year. Average daily solar radiation incident over the land area is in the range of 407 KWh/sq.m. This translates into an SPV power generation potential of 20 MW/sq.Km.

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Another very important conventional and renewable energy source is wind, currently the world’s fastest growing renewable power sources. Wind energy is the transformation of the wind’s kinetic force into mechanical power through a turbine. The mechanical power can be used for such tasks as grinding grain or pumping water, or converted into electricity through a generator for use by home and industrial purposes.

India is the fifth largest wind power producer in the world after Germany, the USA, Denmark and the UK, with a wind power generation capacity of 3,595 MW. The wind potential in India has been estimated at 45,000 MW. The states with high wind power potential are Tamil Nadu, Andhra Pradesh, Karnataka, Kerala, Madhya Pradesh and Maharashtra. Almost 80 per cent of the power thus generated has been used for captive consumption, and the rest sold to the grid or to a third party.

The potential energy of falling water, captured and converted to mechanical energy by water wheels. Hydro energy is derived from flowing water in rivers, water streams in mountains or from man-made installations where water flows from a high - level reservoir
down through a tunnel and away from the dam. Energy from flowing water (or kinetic energy) has been used for centuries to turn water wheels attached to grinding wheels for grinding corn or flour or other machinery in mills and factories.

Hydro energy is now mostly used to generate electrical energy on large scale by collecting water in large reservoirs or dams called hydroelectric power. Turbines placed within the flow of water extract its kinetic energy and convert it to mechanical energy. This cause the turbines to rotate at high speed. The turbines drive a generator that converts the mechanical energy into electrical energy.

The focus of the Small Hydro Power (SHP) is on promoting commercialization and active private sector participation. An estimated potential of about 15,000 MW of SHP exists in India at the moment. The Ministry of Non- Conventional Energy Sources (MNES) currently has a database of 4,233 potential sites with an aggregate capacity of 10,071 MW for projects upto 25 MW. Keeping

in view of the policy of the Government of India to encourage private participation in the field of power generation, the thrust of the SHP programme is to set up commercial SHP projects.

Bio energy is stored energy from the sun contained in materials such as plant matter and animal waste, known as biomass. Biomass is considered renewable because it is quickly replenished. The wide variety of biomass fuel sources includes agricultural residue, pulp/paper mill residue, urban wood waste, forest residue, energy crops, landfill methane, and animal waste. Energy in the form of electricity, heat, steam, and fuels can be derived from these sources through conversion methods such as direct combustion boiler and steam turbines, anaerobic digestion, co-firing, gasification, and pyrolysis.

The various applications of biomass energy include thermal or heat, mechanical water pumping for irrigation and power generation including village electrification and industrial applications. Currently, biomass contributes 14 per cent of the total energy supply worldwide and 38 per cent of this energy is
consumed in developing countries, predominantly in the rural and traditional sectors of the economy.

As against the potential\(^6\) of the order of 19,500 MW, which includes around 3,500 MW of surplus power from bagasse based co-generation and 16,000 MW of grid quality power from surplus biomass material, as capacity of 613 MW has been commissioned and 644 MW capacity is under implementation. Though currently there is no biomass resource atlas available for India but some southern states of India such as Tamil Nadu, Andhra Pradesh and Karnataka have been leading in this sector.

The non-renewable category includes all those sources which are destroyed once they have been used. They are also called depletable or exhaustible sources of energy. All the fossil fuels such as Coal, Petroleum Oil, Shale Oil, Natural gas and Nuclear energy sources come under this category.

1.2 SMALL SCALE INDUSTRIES SECTOR:

Small scale industries are industrial undertakings in which the investments in fixed assets in plant and machinery, whether held on ownership terms or on lease or on hire purchase, do not exceed Rupees One Crore. Small Scale industries constitute an important crucial segment of the industry sector. This sector accounts for about 35 per cent of the total industrial output and contributes 32 per cent to the total export.

In India, the number of registered SSI units got increased from 22.82 lakhs in the year 1997-98 to 25.26 lakhs in the year 1999-2000. The quantum of investment has risen from 70,891 crores in the year 1997-98 to 82,411 crores in the year 1999-2000. The value of output has increased from 48,979 crores in the year 1998-99 to 54,200 crores in the year 1999-2000. Hence, the SSI units provided an employment opportunities to 167.20 lakh persons in the year 1997-98 and it increased to 178.5 lakh persons in the year 1999-2000.
The performance of small scale industry in Tamil Nadu clearly revealed that the number of registered SSI units was increased from 3.25 lakh in the year 1993-99 to 3.55 lakh in the year 1999-2000. The quantum of investment was also increased by 19.32 percent, from Rs.7139.1 crores in the year 1997-98 to Rs.8518.53 crores in the year 1999-2000. The value of output had risen from Rs. 18172.2 crores in the year 1997-98 to Rs.21296.34 crores in the year 1999-2000. These SSI units provided employment opportunities to 31.94 lakh persons during 1999-2000 and it increased by 9.31 percent over the level of 29.22 lakh persons in the year 1998-1999. It may be noted that 11.01 per cent of the total SSI units in Tamil Nadu had provided 17.9 percent of job opportunities. However, Tamil Nadu’s share in total value of output is only 3.7 percent.

The major problems faced by these SSI units are inadequate working capital at affordable rate of interest, insistence of collateral security by the lending banks and the emergence of stiff competition from foreign goods in the wake of economic reforms. It is imperative for the SSI units to identify the gaps in the market.
and evolve suitable marketing strategy with a purpose of getting a full book order for the products.

In order to analyze the Performance of Small Scale Enterprises in Dindigul District, the secondary data regarding the number of units, investment level and employment level had been collected for a period of 5 years from 1997-1998 to 2001-2002. The year wise performance of Small Scale Industries (SSI) in Dindigul District depicted that the number of SSI units was increased to 11,584 units in 2001-02. The percentage growth rate of number of units in Dindigul District was ranged from 16.85 percent to 23.36 percent during the same period. Similarly the investment level had also raised from Rs.517.55 lakhs in 1997-98 to Rs.2441.47 lakhs in 2001-02 . There was a higher level of growth rate (31.50 per cent) in 2001-02 due to the financial liberalization in the Banking sector reforms.

The employment level of SSI units in Dindigul district was 2211 thousand persons in 1997-98 and it increased to 4884 thousand persons in 2001-2002. The industry wise performance of SSI in Dindigul district revealed that of total 5779 registered SSI
units, 1619 (28.02 per cent) Textile Based Industries and 1039 Miscellaneous Industries (17.98 per cent) were in large numbers. Around 194 (3.36 per cent) Building Materials and Ceramics Based Industries and 174 (3.01 per cent) Electrical and Electronics Based Industries were in small numbers in the study district. Similarly in terms of investment and employment level of the SSI Units, the Textiles Based Industries and other Miscellaneous Industries dominated in the district. The investment and employment performance of Building Materials and Ceramics Based Industries and Electrical & Electronics Based Industries were also insignificant in the study district.

The block wise performance of SSI units in Dindigul district exhibits that of the total SSI units (5779 units), 1602 SSI units are located in the Dindigul block. The Dindigul block is situated near the Dindigul Town. The availability of infrastructure facilities influenced the entrepreneurs to set up the SSI units in the Dindigul District. Next to Dindigul block, the large number of industries (1056 units) are located in Palani block and low number of units function only in Natham (107 units) and Kodaikanal block (139 units) of Dindigul district. Similarly, the data analysis on the
employment and investment level in the study district is higher in the Dindigul block and lower in the Natham block.

The category wise growth of SSI units in Dindigul District clearly revealed that the number of units in Food Based Industry has been placed in the fifth position, after Engineering Based Industry, Animal Husbandry Based Industry, Miscellaneous Industry and Textile Based Industry, Hence, there is a steady growth in the number of SSI units year after year.

The block wise growth of SSI units in Dindigul District states that Nilakottai block secured the sixth position after the blocks, namely, Sanarpatty, Batlagundu, Ottanchatram, Palani and Dindigul. The blocks, namely, Natham. and Kodaikanal have a very poor growth of the SSI units.

The category wise investment level of SSI units in Dindigul District indicates that Engineering and allied Industry has higher level of investments and it is placed in the sixth position, after Animal Husbandry Based Industry, Chemical Based Industry, Miscellaneous Industry, Food Based Industry and Textile Based
Industry. It also revealed that Electrical and Electronics Based Industry has a poor investment level after Forest and Agro Based Industry.

The block wise investment level of the SSI units in Dindigul District clearly shows that the Sanarpatty block has higher level of investments and places the sixth position after the blocks namely Oddanchatram, Vedasanthur, Thoppampatti, Palani and Dindigul. Nath am block places the first position in poor investment level, and Kodaikanal and Gujiliamparai have been placed in the second and third position respectively.

The category wise employment growth level of the SSI units in Dindigul District indicates that Animal Husbandry Based Industry has provided a higher level of employment opportunities and it is placed in the fifth position after the categories namely Engineering and allied Industry, Miscellaneous Industry, Food Based Industry and Textile Based Industry. Electrical and Electronics Based Industry provides very poor level of employment opportunities.
The block wise employment generation by the Small Scale Industries in Dindigul District shows that Batlagundu is placed in the seventh position and it provides higher level of job opportunities, after the blocks namely Oddanchatram, Sanarpatti, Nilakkottai, Thoppampatti, Palani and Dindigul. The block namely Gujiliamparai provides the poor level of job opportunities after the blocks namely Natham and Kodaikanal.

It is inferred from the above interpretation, the year wise performance analysis of SSI units are gradual in growth in terms of number of units, employment level and investment level in Dindigul District. The District Industries Centre also involved in the growth and development of the SSI sector. The panchayat unions, namely, Palani, Athoor and Dindigul had also performed the successful growth of the SSI units during the study period from 1997-93 to 2001-02.

In the industrial sector energy's role is all pervading and it is basic to numerous operations of plant and machinery, movement of heavy equipment, material processing, lighting etc. Conservation efforts and measures are likely to have the greatest impact in this
sector in the 21st century. Each and every industry should have an effective energy conservation tool to define and pursue a comprehensive energy management program.

Most companies undertake conservation work primarily to satisfy the statutory requirement that the annual report should contain information on the steps taken to conserve energy. This is probably why research on energy management strategies in Indian industry has not been vigorous. It is certain that energy management will be very useful for all types of industries in combating escalating energy costs. Hence this research study will reveal all the aspects pertaining to energy management in selected small scale industries of Dindigul District

1.3 ENERGY MANAGEMENT 11 SSI SECTOR

Minimum energy consumption or Maximum energy conservation and developing new, eco-friendly and renewable sources of energy are the two different operational aspects of energy management. But most of the entrepreneurs would be struck with existing processes that restricts them to think only in terms of the

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fuel required for that process. Most of them worry about the arrival of new forms of energy which might require them to do process modifications.

Hence, calculating the present energy consumption pattern and identifying energy conservation measures such as

- Using energy wisely and efficiently.
- Learning to be more conscious of the appropriateness of energy use.
- Continuing to expand R and D efforts to overcome the technological problems facing the energy industry and open up new energy resources
- Regulating and consolidating the policies and procedures for energy activities.
- Thinking of an energy establishment at the national level to effectively coordinate the wide ranging energy policies; and
- Ensuring an accelerated development of the domestic resources base are more important than developing renewable sources of energy.
Energy conservation is the most promising single avenue for meeting the energy crisis. A more careful use of energy in the industrial sectors and employment of energy efficient devices can save a tremendous amount of energy. The important objectives of energy conservation (Scanz, 1977) are:

- National security;
- Provision for future generations with an adequate economic base;
- Careful use of depletable energy resources; and
- Uninterrupted energy supply.

Energy management is an important factor for getting the maximum utilization from all energy sources for efficient and smooth economic-activities in the different sectors of the economy.

The basic principles of energy management are to register energy consumption and make use of it for forecasting the energy requirement. For the best energy management, certain planning

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must be done which would ensure no loss of energy at any stage of energy flow from production to the transmission and utilization.

The basic principle of energy management includes energy conservation; that is, using available energy resources more efficiently, and energy substitution, replacing more fuels by cheaper ones (Kettani, 1990).  

According to Smith, 1981 Energy management means a “Task of energy use”. For example, the provision of as much energy as is needed, when it is needed, where it is needed and with quality and quantity required. It is clearly understood that management is defined as The direction, control and organization of business, money, equipment, energy and people towards a profitable goal’, Thus energy management is the most judicious task of energy use.

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According to Khaneja (1992)¹¹ Judicious and efficient utilization of presently available energy source is the only option left to bridge the gap between demand and availability. Such option is known as energy management.

According to the International Labour Organization (ILO, 1991), both management and energy are interconnected concepts with development. Development is a matter of human energies, and the generation and direction (utilization) of all other energy sources is the task of management. Thus the concept of energy management is a balancing element in the use process of energy demand and supply (ILO, 1991).

According to Tunnah(1990)¹² Energy management is a discipline - an organized and structured effort directed towards energy efficiency without reducing living standards or production. This direct involvement rationalizes different choices to achieve efficient and wise use of energy. For energy management, Reddy (1990) ¹³ has suggested four pronged strategies.


They are:

(i) Shifting of freight traffic from road to rail

(ii) Replacing oil with alternative, non-oil fuels particularly bio-mass derived fuels;

(iii) Shifting passenger traffic from personal vehicles to public transportation; and

(iv) Implementing efficiency improvements in the use of petroleum products.

Energy management covers different aspects such as present energy consumption pattern, substitute energy, decision on energy substitution, investments on energy-saving technology implementation, finding the energy consumption pattern after the implementation of energy conservation measures such as process modification or technology upgradation, finding the problems, and difficulties involved in implementing the energy conservation measures.
1.4 STATEMENT OF THE PROBLEM

Small Scale Industries play a key role in country’s economic development with advantages of low investment, low cost technology, labour intensiveness, high potential of employment generation, decentralization of industrial base and dispersal of industries to rural and semi-urban areas. Small scale sector is credited with short gestation periods, conduciveness for its dispersal over wider geographical area and creation of widening base of indigenous entrepreneurship. Upgradation of technology and adoption of other modernization measures have received added attention in the recent years to make this sector more effective. Therefore, the Government accords much importance for the development of small scale industrial units.

Energy is consumed by a diverse group of industries manufacturing, mining, and construction. Overall energy demand and consumption in industrial sector varies from state to state, based on the level and mix of economic activity, technological development and population, among other factors. Each and every industry should have an effective energy management program and
it helps to reap several other benefits like improved production, better quality, higher profits, lower emission of pollutants.

Energy management is a vital sector for optimum utilization of energy sources. Industrial sector being one of the largest users of energy, with primary metals, cement, chemicals, Textiles and paper, accounting for almost 60 per cent of the total industrial energy use in India.

Energy is an index of the economic development. The industrial sector is a major energy consuming sector in India and made use of the 50 per cent of the total commercial energy in the country. The pattern of energy consumption in industrial sector is influenced by many factors such as income level, availability of energy, price or cost of obtaining fuels and efficiency of equipment used. Energy consumption in industrial sector consists of Commercial, Non-Commercial Energy Sources and Human energy. But the contribution of this source in industrial sector depends on the, cost incurred for various activities.
The commercial energy consumption in the industrial sector shows that the share of electricity is higher than that of Coal, Oil and Natural gas. The non-commercial energy used in the industrial sector shows that the share of firewood has increased and the share of Paddy Husk, Groundnut shell and Cashew nut shell have decreased. Human energy used in the industrial sector shows that most of industries are labour-intensive in nature, because of an abundant and cheap supply of labour.

Many reports have pointed out that the Indian Industries are not highly energy intensive when compared to other industrialized countries. Many research works have been carried out in a single sector, or combination of sectors. But only few studies have been made on the energy conservation measures and energy management systems in small scale industrial sector. Energy Management would mean the conservation measures undertaken by the industries. To this extent, the scope of the present study is limited to the identification and conceptualization of the conservation strategies in Small Scale Industries. The present research study have analysed the aspects pertaining to energy management in selected small scale industries of Dindigul District.
1.5 OBJECTIVES OF THE STUDY

The specific objectives of the study are:

i. To examine the energy consumption pattern of selected industries at National Level, State level and at Dindigul district level;

ii. To compare the economics of energy utilization in different category of small scale industries;

iii. To identify the problems and constraints involved in energy management in Small Scale Industries sector; and

iv. To suggest the suitable measures for efficient management of energy in small scale industries.

1.6 HYPOTHESES

1. There is no significant relationship between the energy consumption expenditure and investment in plant and machinery and the production level of various category of SSL

2. There is positive relationship between human energy and production level of the various category of SSL
3. There is insignificant association between the traditional energy utilization and their size of plant, production capacity and literacy level of the SSI entrepreneurs.

1.7 METHODOLOGY - DESIGN OF THE STUDY

Dindigul District is purposively selected for the study, as the researcher belongs to the same district. Hence it is easy for conducting and collecting the information for the research. Secondary data and primary data were used for the study. Secondary data were collected from the reports and records of Dindigul District Industries Centre (DIG), Pollution Control Board, Ministry of Small Scale Industries, Ministry of Non-Conventional Energy Source (MNES), Tamil Nadu Energy Development Agency (TEDA), and Tata Energy Research Institute (TERI), etc.,

There were 11,584 units in Dindigul District in the year 2001-02. Primary data were collected from the small scale enterprises in Dindigul District. Before collecting the primary data, a pilot survey is conducted to identify the units using more than two sources of energy and to strengthen the interview schedule on the basis of experience gained through the field survey. After
conducting the pilot survey, it is decided to cover 1 per cent (120 units) of SSI units by using stratified random sampling.

A total of 120 SSI units had been covered under the eight major categories of SSI units. Generally, Small Scale Industries are classified into eight major groups such as Food Based industry, Forest and Agro Based industry, Animal Husbandry Based industry, Textile Based industry, Chemical Based industry, Building materials and Ceramics Based industry, Engineering and Allied industry and Miscellaneous industry. Three industries from each category were identified for the study based on the criteria such as number of units, investment level and industries using more than two sources of energy. A sample of 5 units from each category of industry is randomly selected for the field survey.

Dindigul District comprises of 14 blocks. The 6 sample blocks of Dindigul District, namely, Dindiugl, Shanarpatty, Vedasanthur, Vadamadurai, Natham and Thoppampatty were covered for the study. From each block, 20 units had been randomly selected for the survey. Hence, the data were collected from 120 units and a total of 120 small scale entrepreneurs were
interviewed with the pre tested interview schedule. The collected primary data were analyzed with the suitable statistical tools like Coefficient of Correlation, ‘t’ test, $X^2$ test, Regression analysis, etc.,

**Table 1.1**
Sample SSI Units in Dindigul District

<table>
<thead>
<tr>
<th>Sl.No</th>
<th>Industry Group</th>
<th>Sample Industries</th>
<th>No. of Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Forest and agro based industry</td>
<td>Corrugated boxes manufacturing unit, Coir robe manufacturing unit Saw mill</td>
<td>5 5 5</td>
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<td>2</td>
<td>Food Based Industry</td>
<td>Bakery, Vermicelli manufacturing unit, Rice mill</td>
<td>5 5 5</td>
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<td>3</td>
<td>Animal Husbandry based industry</td>
<td>Leather Tannery, Animal Glue manufacturing unit and Leather Key chains manufacturing unit.</td>
<td>5 5 5</td>
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<tr>
<td>4</td>
<td>Textile based industry</td>
<td>Ginning Factory, Spinning mills Weaving mills.</td>
<td>5 5 5</td>
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<tr>
<td>5</td>
<td>Chemical based industry</td>
<td>Plastic pots manufacturing unit, Poythene bag and film manufacturing unit Detergents manufacturing units.</td>
<td>5 5 5</td>
</tr>
<tr>
<td>6</td>
<td>Building material and Ceramics based industry</td>
<td>Blue metals, Bricks manufacturing unit, Hollow Blocks manufacturing unit</td>
<td>5 5 5</td>
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<tr>
<td>7</td>
<td>Engineering and allied’ industry</td>
<td>Aluminium utensils manufacturing industry, Automobile spare parts manufacturing unit and Repairing and servicing industry</td>
<td>5 5 5</td>
</tr>
<tr>
<td>8</td>
<td>Miscellaneous Industry</td>
<td>Printing press, Chokes manufacturing unit, Switch Boxes manufacturing unit.</td>
<td>5 5 5</td>
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<tr>
<td></td>
<td><strong>Total</strong></td>
<td>24 industries</td>
<td>120</td>
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<tr>
<td>Sl.No</td>
<td>Sources</td>
<td>Information Collected</td>
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<tr>
<td>1.</td>
<td>District Industries Centre (DIG),</td>
<td>Year Wise Performance of SSI, Industry wise performance of SSI, Block wise performance of SSI, Number of Units (Year wise, Block wise, Category wise) Investment (Year wise, Block wise, Category wise) Employment (Year wise, Block wise, Category wise)</td>
<td></td>
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<td>2.</td>
<td>Pollution Control Board, Dindigul</td>
<td>SSI Classification (Type wise, Fuels wise, Employees wise, Energy consumption wise Category wise) for pollution Identification</td>
<td></td>
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<tr>
<td>3.</td>
<td>Electricity Board, Dindigul</td>
<td>LT Sale of Power-Sector and Year wise Number of units (year wise, Sector wise). HT Sale of power - No. of units sold (Year wise, Sector wise) No. of Consumers (year wise, sector wise)</td>
<td></td>
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<td>4.</td>
<td>Dindigul Collectorate Office</td>
<td>Dindigul District profile, Block profile</td>
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<td>5.</td>
<td><a href="http://WWW.Google.com">WWW.Google.com</a></td>
<td>State Electricity Boards-Sale of power (Number of consumers)</td>
<td></td>
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<tr>
<td>6.</td>
<td><a href="http://WWW.Indiastat.Com">WWW.Indiastat.Com</a></td>
<td>Energy consumption pattern of industries-(Region wise, Year wise) - National Level, State Level.</td>
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</tbody>
</table>
1.8 LIMITATIONS OF THE STUDY

The research study entitled “A study on Energy Management in selected small scale industries of Dindigul District” has some limitations. Limited sample size is one of the limitations of the study. It is difficult to get the accurate information regarding the energy availability and energy utilization of the SSI units, as the entrepreneurs did not maintain the records properly, on the various sources of energy utilization. The researcher used the indirect efforts in getting the accurate information and data from the SSI entrepreneurs.

1.9 CHAPTERISATION

This study is divided into 6 chapters. The first chapter provides a brief introduction, statement of the problem, objectives, scope of the study and methodology. The second chapter reviews the past studies and literatures related to the present study. The third chapter presents the profile of the study area. The fourth chapter deals with the growth and development of energy sector in India and in Tamil Nadu State. The fifth chapter analyses the energy management in selected small scale industries of Dindigul District. The Sixth Chapter gives the summary and conclusion of the study.