INTRODUCTION
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The ceramic industry is one of the most conspicuous and the earliest activity of man-environment interaction and interrelationship. It is also the earliest processing activity along with the development of stonewares and woodenwares. Man in the olden days depended more on natural elements like Air, Water, Earth, Fire and Sky for his day to day living and achievements. Therefore he worshipped them too. The progress of early human civilization commenced with the development of stonewares, woodenwares and earthenwares and the journey of progress continued through the phases of copperware, brassware, bronzeware, other alloyware, plasticware, melaminewares and ceramicwares using natural resources. The earthenwares either in the traditional form of potteries or in the modern form of crockeries are used universally. We take a sip of our morning tea in a stylish cup made of ceramics. All the colourful kitchenwares including some artifacts are made of ceramics. They add glamour to the modern kitchen and bathrooms.

The terms ‘Pottery’ and ‘Ceramics’:

Another ancient term ‘Pottery’ which is derived from French word *Poterie* or the Latin *Potrium* which means a drinking vessel. It is applied to all objects fashioned from clay and then hardened by fire. Thus Pottery has originated from the practice of potting (Sarkar, A.). According to Grimshaw, Rex W., the term ‘Pottery’ includes many varieties of ware, from the crudest vessels of pre-historic times to the most beautifully decorated porcelains, stonewares and earthenwares.

Pottery is said to be the oldest of industries that was born of man’s attempts to fulfill his basic necessities of life. The basic idea to make earthen pot came to ancient woman when she saw the footprints of animals in gummy clay. Due to sun shine the footprints dried and hardened and held rainwater for longer duration. Thus, the idea of pot making originated and accidental baking of pot, led to its improvement. Being one of the oldest crafts (more than 10,000 years old), man has expressed his feelings and his aesthetics in clay i.e., in primitive deities, in various vessels made for the storage of water and grain and in toys (Guruchan Singh, 1979). Many historians believe that Egypt is the country in which clay and glass were first brought together and fused in the form of glazed earthenware, making it impervious to liquid. The Greek pottery
and wares were the best known in the 5th century and the Greek craftsmanship influenced the Roman art of pottery. The printed pottery was well known in China and they exported porcelainous ware to Korea, Japan and Islamic countries (Gupta, K.C., 1988). Today, China, Italy and Spain are the leading producers and exporters of variety of potteries as well as ceramic products with a greater proportion of ceramic titles. In India too the Pottery is one of the most ancient and important village industry. Rig-veda mentions the use of potterywares dating back to 2000-3000 B.C. It refers to the famous potteries such as Drona-Kalash, Churu, Darba, Pushpachali, etc. Among them Drona-Kalash was most famous pottery of that time, which was used for storing 'Soma-rasa'. The eminent historians and archeologists agree that the vedic age is older than the Nile Valley, Rhine, Elbe and Indus Valley Civilizations. Thus, the pottery and ceramic art was most ancient in Indian and then Egypt. From India, it traveled towards Persian Gulf, Persia, Greece and China, Korea and Japan and from Egypt it traveled to Crete, Sicily, Italy, Spain, France, Germany and other European countries.

The Ceramics term originated from a Greek word Keramic - originated from ancient Greek word ‘Kermos’ which meant a burnt stuff and ‘Keramic’ means an art of potter. In other words ceramics means the art of making articles of clay by firing them to hard stony products. The modern ceramics include the whole range of articles made up of inorganic non-metallic minerals. Now, it is a usual practice to define Ceramic product as an article made from clay with or without the addition of other materials and is an art of moulding, modeling and baking clay till it is hardened. Ceramic industry is basically clay based which mainly consists of hydrous aluminium silicate with varying quantities of humiral and organic impurities. Its main property is the plasticity that permits objects to be moulded and developed by various methods and techniques of production which relates to high temperature treatments. The clays which are used in the production of variety of products are mainly China clay, ball clay and fire clay. The term ‘Ceramics’ was originally applied to pottery. However, now its scope has been widened to include all products fashioned from silicates or oxides and rendered durable in form and composition by a heat treatment applied at some stage of the process. (Barringer, 1939). Thus, ceramics is an art and science of making wide ranging products of clay with or without the addition of other inorganic non-metallic materials which are initially modelled when in Plastic State retain their shapes and later on fired to the desired strength.

The ceramic industry in the modern day context produces not only the pottery products but also the variety of ceramic products. The ceramic industry in India is about 100 years old.
and the credit of establishing modern ceramic unit goes to D.C. Majumdar who produced commercially the fine earthenwares in Gwalior in the year 1858. However, the ceramic industry in India is mainly concentrated at Khurja in Uttar Pradesh for pottery products and Morbi in Gujarat for a variety of ceramic products. The other states where most of the ceramic units are located comprise Kerala and Rajasthan. At the global level, the art and science of manufacturing ceramic products has made great stride in China, Germany, U.K., Italy, USA and in certain other varieties France, Spain, India, Iran, Netherlands and Turkey. Although, India is one of the earliest in producing pottery goods, at present times, it is striving to develop on modern lines with the technological advancements.

In the global market, China accounts for 30.36 percent (2003) of the total world exports of pottery products whereas it accounts for 16.53 percent of sanitarywares. In both the products China is a world leading exporter. Next to China is Germany accounting for 8.74 percent (pottery products) and 12.42 percent (sanitarywares) respectively. For refractory and building materials, Italy has 30.18 percent of world exports and for floor tiles it is Belgium accounting for 23.02 percent. Among these four major categories of exports sanitarywares, refractory construction material, floor coverings and pottery, India figures out in the world export share of 7.30 percent in floor tiles. India’s major export destinations are UAE, U.K., Saudi Arabia, Indonesia, Germany, USA, Sri Lanka, Nepal, Qatar, Italy, South Africa, Kuwait, and Australia in the decreasing magnitude of exports. India ranks 7th in the world in terms of production of ceramic tiles which accounts for 2.5 percent of the world ceramic tile production (i.e. 200 million Sq.meters out of a total world production of 6400 million Sq.meters. The ceramic tiles industry in India comprises of 16 units in the organized sector and about 1200 units in the unorganized sector of which 70 percent are based in Gujarat region. 16 units of organized sector contribute 56 percent and 1200 units (mostly small scale) of unorganized sector contribute 44 percent of the total production of 200 million square meters (2003-04). Thus, Gujarat is one of the leading state, in India in the production of variety of ceramic products including ceramic tiles.

The Government of Gujarat launched Ceramic Clusters Development programme (GCDP) in 2000. The programme covers four ceramic clusters namely Morbi-Wankaner, Thangadh, Ahmedabad and Himmatnagar where about 480 small and medium units produce crockerywares, sanitarywares and ceramic tiles. On account of GCDP, the ceramic industries in these four clusters have not only been able to reduce their wastes to the tune of 60 to 80 percent
at different stages of production but also over 60 percent of the industries achieved product quality standard according to the required specifications. Thus the ceramic industry of India is not only concentrated in Gujarat – Morbi-Wankaner – Thangadh but also produce quality products of ceramic tiles, sanitarywares and crockerywares. This existing unique industrial scenario prompts for an in-depth study and analysis of geographical factors, location inertia in terms of raw materials, labour, capital, transport-market-network and eco-development implications including environmental degradation and social health hazards.

Range of Ceramic Products:

Ceramics is classified into 12 major groups on the basis of design and utility of the product. They are Refractories, Sanitarywares, Glazed Tiles, Capacitors, High and low Tension insulators, Abrasive Grains, Stoneware Jars, Stoneware Pipes, Synthetic stones, Enamel wares and frites, crockery and terracotta. However, based on the utility sector ceramics may be classified into – ceramic building material, ceramic sanitary products, ceramic home products, chemical ceramics, electrical ceramic products, electronic ceramic products and ceramic refractories.

The ceramic products are used widely from households to modern research laboratories and from electrical and electronic devices to satellite technology. The 12 important types of ceramics mentioned above are detailed below:

1. Refractories:
   High quality ceramic products which can withstand high temperature level of 1300° to 1400° C are called as refractories. Among the several refractories firebricks, fireclay bricks, kiln furniture, metal melting pots, crucibles, high temperature vessels, ceramic for gas turbines, iron and steel, non-ferrous metal, thermal, hydel, nuclear power, paper, enamel industries are important.

2. Sanitarywares:
   Among the ceramic products, sanitarywares are the most important in safeguarding health and hygiene. Relatively low priced and widely used sanitarywares are wash-basins and closets and high quality and high priced products are sinks, urinal stalls, wash tubs, sinks and latrine sheets.
3. Glazed Tiles:
Glazed tiles are manufactured by using china clay and are more attractive, colourful and expensive compared to mosaic tiles. They are widely used in religious institutions, museums, palaces, hospitals, shopping malls, swimming pools and in other monumental buildings and also are profusely used to cover not only the floors but also walls and ceilings. These tiles are acid and alkali-proof.

4. Insulators:
The porcelain and china clay are non-conductive, hence are used to make electrical devices such as switches, fuse-sockets, lamp-holders, insulated pipes, high tension and low tension insulators, circuit breakers, insulated pipes, and insulators to handle the high tension cablewires.

5. Abrasive grains:
It is one of the most important ceramic products. Abrasive ceramic product has different kinds of emery stones that is capable of sharpening the edges of knives, pen knives, scissors, hacksaw and tools of carpenters. The grinding wheels, emery stones, sand papers, emery papers are some of the abrasive grain products.

6. Stoneware Jars:
Not very high quality of china clay is used but high quality procedure is followed in its production. They are made as per the requirements. Generally, the jars have white glazed surface inside and coloured surface outside. They are used for industrial storage purpose namely acid alkalies, chemicals, etc. tanning baths, brewing vats and for domestic storage purpose – namely pickles, ghee, oil, spices, etc.

7. Stoneware Pipes:
This type of ceramic product includes mainly solid and durable like stone products. Among them drainage pipes are most important and are in great demand due to the development of cities all over the world and more so in India. To produce stoneware pipes, paper weight buttons, costume jewellery, flower pots and dental porcelain require temperature of about 1200° C. They are approximately less than 3 percent porous.
8. Synthetic stones:
The products produced from the stone or after grinding the stone are known as synthetic stones. The other products that belong to this category are buttons, beads, costume jewellery and dental porcelain.

9. Frites:
These are the fancy and decorative ceramic products which are produced by mixing the raw materials of glass. The important products of frites are paper weight, drawer knob, candle-stand, pen-stand, pin tray, jewelleries, ink-pot, other decorative items and also some special equipments of chemical laboratories.

10. Porcelain wares:
The porcelain wares are made out of best quality china clay. Hence, china clay is referred as porcelain. These products neither break nor crack at even high temperature. The containers used under high extreme temperatures such as evaporating dishes, crystallizing cups, bowls, incubators, sand hearths, electrical insulators, tea sets, crucibles, etc. are made from porcelain.

11. Crockery:
The crockery products of high quality are thin, light weight, sparkling glaze and fine coloured. Their costs and price depend upon its raw material, artistic mould and colouring. They are cups and saucers, plates, dishes, bowls, glasses, pots, kettles, mugs, jugs and other household day-to-day utility articles. In case of raw material of crockery products, finer the quality of clay, thinner the crockery and the more durable is the product.

12. Terracotta:
The meaning of ‘terracotta’ is baked clay in which category all spongy, porous and non-glittering products are included. Any soil can produce terracotta items provided a heat treatment to the extent of 750° to 900° C is given. Clay toys, bricks, roofing tiles and even pottery wares are the products of terracotta. Mangalore roofing tiles and other simple tiles are the best examples of terracotta which are widely used.
Important Raw Materials and Processes:

For the above mentioned 12 broad categories of ceramic products, the important raw materials remain porcelain, china clay (caolinite), clay, ball clay, silica, limestone, gypsum, quartz, feldspar, flint dolomite flurite, soapstone, caoline and fire clay. However, china clay remains by far the main raw material for ceramic industry. The raw material of ceramic industry undergoes numerous processes and stages before the ceramic product comes out of the production line. The various processes are crushing, grinding, tempering, blunging soft and stiff mud processing, dry press and slip casting process, drying, firing, glazing, colouring, enamelling and decoration. Like the various processes of tea powder, container cup or jug also has elaborate processes and stages. Thus, variety of raw materials are used in the diversification of ceramic industry.

The growth and development of ceramic industry in terms of number, diverse products, is mainly due to the development of science and technology, industrialization, urbanization and modernization. However, the origin of this industry lies in pottery making confined to early river valley civilizations.

The above mentioned aspects of raw material and nature of product i.e. raw material – product nexus is studied and analysed in the locational framework with backward and forward linkages and economy environment impacts.

The Art of Pottery Work in Ancient Civilization:

About 15,000 – 20,000 years ago, man used stones to make weapons and also expressed his ideas by giving different shapes to them. Early man used ivory and horns to produce artistic works, used clay for artistic pottery. The evidences show the use of colourful flower vase and other vessels made out of clay way back in 4500 – 500 BC in the Nile Valley Civilization. Sumerian Civilization that thrived in the Euphratis and Tigris valleys show that the early Sumerians had started the clay works and also writings on clay tablet. Crete island Civilization (3600 – 1100 BC) had craftsmen who produced variety of pots and vases. They decorated their kings palace with their artistic colourful pottery works. They exported the flower vases to other countries. Cretes clay works had greater influence on Greek Civilization. Human figures and other artistic work can be seen on the clay vessels of greek Civilization (1100 – 400 BC). Shipload of artistic works (including clay vessels) were brought from Greece to Rome. Romans were known for constructing monumental buildings and used imported clay models of Greece to decorate the magnificent buildings (600-400 BC). Chinese Civilization (3009 BC) that
flourished in Hwang Ho and Yangtse river valleys, have given pictorial script and clay work as
great heritage to the world. Their clay works are artistic, special and highly acclaimed at the
world level, China is on the top of the world as far as ceramics and potteries are concerned
(leading exporter in the global marke – 30 percent – 2003) and their products are artistic
colourful, attractive elegant and competitively priced. Around the same time the Indus Valley
Civilization flourished. Earthenwares and vessels of daily use and earthen containrs with
artistic work on them to bury the dead body were made by ancient Indians. However, Indian
pottery was very much influenced by the Sumerian Civilization. Since the days of Egyptian
(Nile Valley), Indian (Indus Valley) and Chinese (Hwang Ho and Yangtse Valley) civilizations,
the pottery and ceramic industry has survived at all times and progressed by adapting to the
changing conditions of technology and needs of industry and society. This is clearly evident in
the production of diverse products of quality and durability.

Review of Literature:

Several scholars have studied varied aspects of pottery and ceramic industry in India and
abroad. The industry is viewed by varied perspectives by different scholars depending upon their
interest and specialization. Historians with specialization in Archeology, Social history,
economic history, ancient culture have studied pottery works purely from art, culture, social an
economic point of view. Gujarat’s pottery work has been traced back to Indus Valley civilization
through archeological evidences found near Lothal, Cambay, Sinor Bhiloda and Amreli
(Purohit, S.P. 1975, Patel, A.J. 1974; Sharma, V.D., 1965; Bist, N.S. 1978). As part of ‘Surveys
of Indian Industries’, ceramic industry (Chapter VIII) has been studied to trace its origin, growth
and development in India (B.Srinivas Rao, 1958). Status of ceramic industry, its problems and
prospects have been analysed and certain useful recommendations have been made (Ojha, A.K.,
the economic importance of ceramic industry in India was made by N.S. Bist (1978). The study
highlights historical resume, raw material, economics of production, capita, finance, labour,
transport and marketing aspects. Another study refers to the progress and prospects of pottery
industry in India with a case study of Uttar Pradesh (Gupta, K.C., 1988). Energy Conservation in
the Whiteware Industry – The Indian Scenario (Mukhopadhyay, T.K., and T.K. Dan, 1996), Bio-
Ceramics – Clinical and Pharmaceutical Applications, (Karkhanis, M.V. et.al. 1999) are the
other studies with special perspective.
In the developed countries due to their early industrial development, economists and geographers carried out several industrial studies and formulated theories of location, growth distribution and development. Among them the study on the location of industry (Weber, A., 1929), the location of economic activity (Hoover, E.M. 1948), the economics of location, (Losch, A., 1954), Location and Space economy, (Isard, W. 1956), Plant location in Theory and Practice (Greenhut, M.L. 1956) and Locational Analysis in Human Geography (Haggett, P. 1965), Geography of Industrial localization (Renner, G.T. 1947) and Principles of Industrial Location (Rawstrom, E.W. 1958) are important. However, the studies on Indian industry are mainly empirical and of post-1950 period. Several Indian geographers have continued to study the aspects of industrial location, evolution, growth, resource orientation, industrial complexes and regions, and environmental issues. Among the several studies on locational analysis of specific industries and group of industries such as traditional industries, small, medium and large industries and manufacturing industries, study of iron and steel in India (Brush, J.E. 1952; Loknathan, 1952; Karan, P.P. 1957; R.P. Singh, 1980; S. Bhatara, 1982; S.S. Sidhu, 1984), the location and development of Aluminium Industry in India (Dayal, P. 1958), Cement industry in India (Bhat, L.S., 1965), location of petro-chemical industry (J.De: 1979, K.N. Das and K.K.L. Das, 1976). Evolution of cotton textile industry in India (D.V. Shastry, 1984; K. Chatterjee, 1979), Woollen industry (R.Chand, 1979), Indian Tea industry (M. Ahmad, 1981), Sugar Industry (S.L. Kayastha and M.B. Singh, 1980) are important. Other highly specialized industries which are studied include sericulture (S.V. Chaudhary, 1980), Forest based industries (K. Ghosh, 1978), Ivory Carving industry (K. Chatterjee, 1979), resin industry (D.H. Jalal, 1980) and horn industry (M.M. Pal, 1978). Also there are few studies which focus on the industrial impact on environment (M.R. Chaudhary, 1982; S.C. Mukhopadhyay, 1982) and economic impact on tribal development (B. Srivastava, 1978).

The present literature survey points out the absence of the study of ceramic industry in India from the geographical perspective. Therefore, the present study attempts to fill this gap by making in-depth analysis of geographical factors influencing the location of ceramic industry, their backward and forward linkages (movement of labour, raw material, power, and finished ceramic products) and impact on economy and environment. Secondly, at the national level, Gujarat is one of the leading states in the production of ceramic goods. Thus the industry is regionally and nationally important and worthwhile to understand its geographical facets.
Fig. 1.1: Potteries and Ceramics in Ancient World