Increasing urbanization and industrialization resulted in drastic increase in the volume of wastewater production around the world. Textile industries are large industrial consumers of water as well as producers of wastewater. In recent days, the textile industries are facing problem in operation particularly textile dyeing, since the regulatory body insists on zero discharge norms. Effluent quality limits can be difficult for companies to meet and are likely to become more stringent, requiring textile dyeing and finishing operations to employ waste minimization, to avoid resorting to expensive on-site treatment.

Tirupur district of Tamilnadu in India is well known for its textile cluster units. Any normal dyeing unit may take 200 litres of water to produce dye and finish one kilogram of finished textile products. The industry has a high demand for water and serious effluent management issues to redress. Textile finishing also requires the input of a wide range of chemicals which, if not contained in the final product, becomes a waste and a disposal problem. A large proportion of the environmental issues affecting the industry are related to the use and discharge of water. Washings from dyeing and rinsing operations may produce hot, alkaline, highly saline, odorous and highly coloured effluent. Other environmental issues requiring consideration are energy, chemical usage, stormwater, solid wastes and emissions to atmosphere, contaminated land, noise, hazardous materials, groundwater and other environmental issues particular to the location of a facility. The most difficult environmental issue for the textile dyeing and
finishing industry is the generation of wastewater. The textile industries follow spinning of fibre to yarn, sizing to improve stiffness, scouring, kiering and desizing to remove excess sizing materials, bleaching to remove pectin and wax from the yarn and fabric and colouring and printing to provide desired colour and design to the cloth. Dyeing is a combined process of bleaching and colouring, which generates voluminous quantities of wastewater and in turn causes environmental degradation. Main pollution in textile wastewater came from dyeing and finishing processes. These processes require the input of a wide range of chemicals and dyestuff, which generally are organic compounds of complex structure. All of these are not contained in the final product, become waste and cause disposal problem. Major pollutants in textile wastewater are highly suspended solids, chemical oxygen demand, heat, colour, acidity and other soluble substances (Dae-Hee et al., 1999). The effluents consist of high TDS, sodium, chloride, sulphate, hardness and carcinogenic dye ingredients. High BOD effluents are generated from the sizing and desizing processes and treated by conventional anaerobic and aerobic biological methods (Tchobanoglous and Burton, 1995). The raw materials for the manufacture of dyes are mainly aromatic hydrocarbons (Kent, 1974). In addition to dyes, wastewater also contains solids, oil and halogenated organics from processes such as bleaching operation. Moreover, some compounds may be applied to fibres in processes preceding the final step of washing to improve the properties of fibres. Compounds such as surfactants, sizing, coating and finishing additives may be released to the effluent water during washing. Sizing compounds such as starch contribute to increased chemical oxygen demand (COD) of the wastewater stream. Synthetic sizing additives which are not as biodegradable as starches, can pass through conventional wastewater treatment systems
are often linked to aquatic toxicity in receiving water. In the removal of colour from
textile industry and dyestuff manufacturing industry, wastewater represents a major
environmental concern. In addition, only 47% of 87 dyestuff are biodegradable (Pagga
and Brown, 1986). It has been documented that residual colour is usually due to insoluble
dyes which have low biodegradability as reactive blue 21, direct blue 80 and vat violet
with COD/BOD ratio of 59.0, 17.7 and 10.8 respectively (Marmagne and Coste, 1996).
Conventional oxidation treatment has found difficulty to oxidize dyestuffs and complex
structure of organic compounds at low concentration or if they are especially refractory to
the oxidants. To ease the stated problem, dyes and chemical additions that make the
environmental challenge for textile industry not only as liquid waste but also its chemical
composition (Venceslau et al., 1994). Textile dyeing industries in Erode and Tirupur
districts of Tamilnadu (India) discharge effluents ranging between 100 and 200m³/t of
production. Dyeing is performed by Jigger or advanced Soft Flow Reactor process.
Colouring of hosiery fabric takes place in the presence of high concentration of sodium
sulphate or sodium chloride in dye solutions (Rameshkumar et al., 2009).

Continuous effluent discharge has caused gross damages to the nearby aquatic
receiving body like Orathupalayam dam located at the downstream of river Noyyal and
as such the water quality has become unfit for irrigation. The reservoir water’s TDS,
chloride and sodium were reported as high as 5054, 2869 and 1620 mg/L, respectively
(Central Pollution Control Board, 2005). Also the concentration of dissolved solids in the
ground and river water is reported in the range of 5000–7000 mg/L i.e. almost ten times
higher than the desirable drinking water standard (Indian Standard, 1991). A study
carried out by Rajaguru et al. (2002) indicates that the ground water in Tirupur area is also contaminated with substances capable of inducing DNA damage in human cells.

Many of the steps taken to treat wastewater result in concentrating the pollutants of the sludges (Priestly, 1991). In Tirupur, some of the sludge is disposed to an engineered land fill, much of the sludge is openly dumped, which leads to soil, surface water and ground water contaminations (Balasubramanian et al., 2006). The inorganic salts and toxic metals in the sludge pose a threat to residents (Thomson et al., 1999; Palanivelu and Kumar, 2001). In the recent times, efforts have been geared towards the treatment of domestic and industrial wastewater while the sludge associated with them is merely dumped untreated in the environment. The unregulated waste dumps and landfills cause a number of environmental and human health hazards, the most significant of them being the ground water contamination. Growing concerns about public health and degrading groundwater quality due to the polluting waste dumps and landfills call for taking appropriate remedial action or control measures at these sites (Kylefors et al., 2003). The leachates contamination of groundwater is the most significant of all landfill hazards. The continuing growth in generation of solid waste and disposal of solid waste is a serious issue challenging the urban planners in fast growing cities. Mainly, unplanned growth of urban population causes reckless generation of solid waste and exerts tremendous pressure on existing service (Jones et al., 1977). The chemical composition of such leachates depends on the nature and age of the landfill and the leaching rate. Most leachates emanating from municipal solid wastes are not only high in organic content but also contain some toxic material (Mor et al., 2006). Leachates from solid wastes of industrial origin, however, often contain a much higher proportion of toxic constituents,
such as metals and organic pollutants. An environmental characterization study with respect to chemical and leachate’s properties of industrial solid waste has drawn considerable concern and attention (Francis and White, 1987; Sripriya et al., 1998; Balakrishnan et al., 2008; Tyagai et al., 2000). Indiscriminate disposal of solid wastes resulted in leaching and then contaminating the surrounding soil and nearby water bodies (Shasi Mathur and Vishnu, 2000; Hemalatha and Palanivel, 2008). Significantly high concentration of electrical conductivity, dissolved solids, alkalinity, hardness and chlorides were high near the waste disposed sites (Kumaraswamy, 1997b). The disposal of industrial solid waste becomes a problem unless it is used more efficiently (Bhattacharya and Shekdar, 2003).

Because of the hazards associated with the large amounts of dye house wastewater, several studies were conducted worldwide resulting in a number of treatment techniques for this wastewater. The complexity of these techniques depends on the intended fate of the treated water to a large extent and the environmental laws of the country in which it exists (Vandevivere et al., 1998; Tunay et al., 1986; Slokar and Le Marechal, 1998; Rott and Minke, 1999). Treatment technologies can generally be divided into Physico-chemical (coagulation, electrochemical, filtration, ion exchange, adsorption, membrane, and photolysis) and biological methods. Research has been conducted to recycle valuable material and reduce the volume of hazardous solid waste and other pollutants, which are harmful for living organisms. For the industries, disposal of sludge is a very costly method, due to long-distance transportation and the use of illegal or questionable disposal methods. The industries are trying to reuse solid waste material on the construction sites (Badur and Chaudhary, 2008).
Dyeing Industry Effluent Treatment Plant sludge is classified as hazardous waste, generated during the primary treatment of textile effluents. Thousands of tonnes of sludge generated in the last ten years are piled up at common and individual effluent treatment plants. The effluents generated are treated at effluent treatment plants. Almost 8.8 crore litres of effluents, after primary treatment in effluent treatment plants, are being let out into the Noyyal river every day in Tirupur alone. One tonne of dewatered sludge is produced for every 5001000 m³ of wastewater treated. They all generate dried sludge amounting to an estimated 88 tonnes a day in the city. About 200 tonnes/day of textile sludge is generated in Tirupur (Balasubramanian et al., 2006). The sludge, a highly hazardous chemical waste, is stored in open yards. The industry also struggles to find a place for a landfill of this sludge. “Landfill is not a solution to pollution” during rainy days. The dyeing industrial effluent treatment plants dissolve in rain water and leaches into the ground and further surface runoff from these yards pollutes streams and rivers. Dyeing industrial effluent treatment plants consist of dye waste, lime, ferrous sulphate, coagulant aids and polyelectrolyte etc (Balasubramanian et al., 2005). The hazardous waste needs to be disposed off in a secured manner in view of their characteristic properties, because severe pollution of land, surface and ground water may occur (Ramakrishna and Babu, 1999a; Rao, 1999). There is a growing concern all over the world for the safe disposal of HWs generated from anthropogenic sources. HWs can be classified (Babu and Gupta, 1997) into (i) Solid wastes (ii) Liquid wastes (iii) Gaseous wastes and (iv) Sludge wastes. HPC (High Powered Committee on Management of Hazardous Wastes, 2001) defines hazardous waste as any substance, whether in solid, liquid or gaseous form, which has no foreseeable use and which by reasons of any
Hazardous wastes are disposed off at centralized disposal facility, catering to the hazardous waste generated in the near vicinity. These facilities will help the small and medium scale industries generating hazardous waste in disposing of their wastes efficiently (Ramakrishna and Babu, 1999b; Lakshmi, 1999; Babu and Ramakrishna, 2000; Babu and Ramakrishna, 2003). The planning for hazardous waste management comprises of several aspects ranging from identification and quantification of hazardous waste to development and monitoring of treatment, storage and disposal facility.

The Government of India has promulgated the Hazardous Waste (Management & Handling) Rules in 1989 through the Ministry of Environment and Forests (MoEF) under the aegis of Environment (Protection) Act-1986. Under the Hazardous Waste (Management & Handling) Rules, the hazardous wastes are divided into 18 categories. Moreover, the role and responsibilities of the waste generator, State/Central pollution control boards and State Government, are clearly defined. In order to encourage the effective implementation of these rules, the MoEF has further brought out the Guidelines for Hazardous Waste (Management & Handling) Rules in 1991 (Maudgal, 1995; Ramakrishna and Babu, 1999b) giving the technical details of the principles of...
hazardous waste management covered under the Hazardous Waste (Management & Handling) Rules, 1989. However, the selection of a suitable site for an effective functioning of treatment, storage and disposal facility is the key aspect and depends upon several factors such as waste characteristics, site characteristics, public acceptance and prevailing laws and regulations. The facility at the site of disposal should also incorporate the protection of human health, environment and property values in a community.

Textile industry is one of the most polluting industries. The nature of sludge resulting from the chemical coagulation of effluent depends on the nature of the coagulant used and point of chemical application (Naik, 2001). Frequent changes in the dye stuff employed in the dyeing processes cause considerable variations in the characteristics of the effluent (Gurunham, 1965; Kothandaraman et al., 1976; Mathur et al., 2005). The elemental concentration of industrial solid waste will depend on a number of factors such as raw materials used, process technologies adopted and the efficiency of the systems (Block and Dams, 1976; Sripriya et al., 1998; Khitoliya, 2004).

The sludge is alkaline in nature with high electrical conductivity values (Patel and Pondey, 2009). The sludge generated from textile industry is both organic and inorganic with measurable quantities of metals and other compounds. The sludge can contribute to low dissolved oxygen concentration in areas where sludge solids are concentrated. Land application of sludges leads to lechates problem, ground water pollution, erosion, runoff and odour. It may also affect the food chain (Raymond and Loehz, 1981).

The treatability studies using solidification/stabilization indicate that chemical sludge generated from treatment of textile dyeing waste water has the possibility to be
used as the construction material (Patel and Pondey, 2009). The heavy metal concentrations in the leachates were compared with USEPA regulatory limits and were found to be in negligible quantity as compared to the stipulated limits. In the construction of buildings, concrete hollow and solid blocks, bricks, pavement blocks and tiles are used everywhere. These materials are manufactured from the available natural resources. During the production of the above construction materials, different varieties of toxic elements such as carbon monoxide, oxides of sulphur and nitrogen and suspended particulate matters are discharged into the atmosphere at increased concentration. Moreover, the emission of toxic substances contaminates air, water, soil, flora and fauna and also affects the living standard of human life. The issues related to conservation of environment, animal and human health has gained great importance in the contemporary context.

The decision-makers in political, economic and social sectors are now seriously offering more attention to the environment issues. Consequently, major changes regarding the conservation of resources and recycling of wastes by proper management are taking place in our ways of living and working. Many authorities and investigators of late, working to have the privilege of reusing the wastes in construction materials is one of such innovative efforts. As there is a great demand for construction materials and shortage of raw materials and energy resources in the present situation, the price of the building materials have escalated exorbitantly. So the use of alternative materials in the production of bricks, concrete hollow and solid blocks, pavement blocks and tiles is of international concern. Throughout the globe today extensive and intensive research is
being carried out to find out an eco-friendly and viable substitute for the present day construction materials.

The disposal of these wastes has become a major environmental problem in Malaysia and thus the possibility of recycling the solid wastes for use in construction materials is of increasing importance. In recent years the construction industry has shown considerable interest in the utilization of waste (Connan et al., 2005). The high consumption of raw materials by the construction sector, results in chronic shortage of building materials and the associated environmental damage. Concrete industry is particularly important as it is not only responsible for consuming natural resources and energy but also for its capacity of absorbing other industrial waste and by-products (Safiuddin et al., 2007a). For this reason, the civil and environmental engineers have been challenged to convert the industrial wastes to useful building and construction materials (Turgut and Algin, 2007). The recycling of solid wastes in civil engineering applications has undergone considerable development over a very long time. The utilization of fly ash, blast furnace slag, phosphogypsum, recycled aggregates, red mud, Kraft pulp production residue, tea waste, etc., in construction materials shows some examples of the success of research in this area. Similarly, the recycling of hazardous wastes for use in construction materials and the environmental impact of such practices has been studied for many years (Cyr et al., 2004). Growth of population, increasing urbanization and rising standards of living due to technological innovations have contributed to increase the quantity of a variety of solid wastes generated by industrial, mining, domestic and agricultural activities. Globally, the estimated quantity of solid wastes generation was 12 billion tonnes in the year 2002 (Pappu et al., 2007). Among this
amount, 11 billion tonnes were industrial solid wastes and 1.6 billion tonnes were municipal solid wastes. About 19 billion tonnes of solid wastes are expected to be generated annually by the year 2025 (Yoshizawa et al., 2004). Annually, Asia alone generates 4.4 billion tonnes of solid wastes. About 6% of this amount is generated in India (Yoshizawa et al., 2004; Central Population Control Board, 2000).

Many scholars in different disciplines have studied how to convert waste sludges from domestic and industrial operations into useful products, such as retrieving the organic components in sludge to improve farm land, palletized aggregate for concrete (Liaw, 1998; Tay et al., 2000), replacing cement in concrete, production of ceramic bricks and tiles (Romoualdo, 2005), mixing sludge with clay to produce building bricks (Demir et al., 2005; Anderson, 2002). Kaushik and Garg, (2004); Garg and Kaushik, (2005) also reported the utilization of textile industry sludge in vermistabilisation.

It is estimated that demand in the form of building materials would be on the order of US dollar1333 million per year in India (Anon, 2002). In India, nearly 250 million tonnes of wastes are generated annually (Laul, 2002), other industrial wastes have been used in building materials, partial replacement of clay in bricks or for use in flooring tiles and walling materials (Sharma and Laxmi, 2002; Singh, 2002). Saxena et al., (2002) reported the use of copper tailings upto 50% in replacement of clay in the manufacture of bricks and found properties on par with standard bricks meeting the relevant BIS. Sengupta et al., (2002) reported that the bricks prepared in commercial plants using petroleum effluent treatment plant sludge met all the requirements as described in the Indian standard. Singh (2002) and Singh et al., (2003) reported the use of beneficial
phosphor-gypsum (a byproduct of building) materials like semi-hydrated plasters and plaster products, fibrous gypsum, plaster boards and gypsum tiles. Quijorna et al., (2008) reported that the foundry slag improves the mechanical properties of ceramic bricks. Balasubramanian et al., (2006) and Ragunathan et al., (2010) reported that use of textile sludge in the non-structural building material could serve as an alternative solution to disposal.

The inorganic salts and toxic metals in the sludge pose a threat to residents (Thomson et al., 1999; Palanivelu and Kumar, 2001). The conventional disposal methods like land filling and incineration may not be suitable because the lechates from the land filling sites and the residues from the incinerators induce secondary pollution. Moreover such disposal options are not economically viable. The sludge as such cannot be applied to fertile lands because of its chemical contents. The dye-house sludge waste is categorized under toxic substances by statutory authorities. As the amount of sludge produced by wastewater treatment plants increases effective reuse and safe disposal of sludge becomes more important (Baskar et al., 2006).

The recycling of waste and by-products attracts an increasing interest worldwide due to the high environmental impact of the cement and concrete industries. Normal concrete is manufactured using sand and stones, but lightweight concrete can be made by using industrial by-products and hazardous solid wastes such as expanded fly ash, slag, sludge etc.

The final destination of water treatment sludge affects the environment. Since land is limited, alternative technologies to dispose off water treatment sludge are essential.
Incineration may be a profitable alternative technology of disposal but the final disposal of a huge quantity of water treatment sludge ash would pose another problem (Jones et al., 1977). Thaniya Kaosol (2010) reported the use and disposal of the water treatment plant waste as hollow concrete block. Therefore, this study was conducted to investigate the feasibility of using the dyeing industrial effluent treatment plant sludge for producing concrete aggregates and concrete products like concrete hollow and solid blocks.

A typical concrete block weighs from 17.2 to 19.5 kg. The concrete block construction is gaining importance in developing countries. Even in low-cost housing, it has become a valid alternative to fired clay bricks, stabilized soil, stone, timber and other common constructions. The ingredients are available locally and are of good quality. Concrete blocks are produced in a large variety of shapes and sizes, either solid or hollow, dense or lightweight, air-cured or steam-cured, load bearing or non-load bearing and can be produced manually or with the help of machines. The main properties of the most common type of concrete are: (a) high compressive strength, resistance to weathering, impact and abrasion; (b) low tensile strength; (c) capability of being molded into components of any shape and size and (d) good fire resistance up to about 400°C. The use of concrete hollow blocks has several advantages: (i) they can be made larger than solid blocks; (ii) they require far less mortar than solid blocks and construction of walls is easier and quicker; (iii) the voids can filled with steel bars and concrete, achieving high seismic resistance and (iv) the cavities can be used as ducts for electrical installation and plumbing.