USE OF TREATED DOMESTIC WASTEWATER IN CLAY BRICKS

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Abstract: Present investigation deals with the use of treated domestic wastewater (TDWW) in clay bricks. The experimental results show that treated domestic wastewater (TDWW) and Potable water (PW) were produced almost same compressive i,e,. 11.8MPa. Water absorption was also same in bricks cast with TDWW and PW. No efflorescence was appeared on bricks due to use of treated domestic wastewater. Hence, for making conventional purpose bricks, treated domestic wastewater (TDWW) can use in clay bricks production.

Keywords- Treated domestic wastewater, Potable water, water absorption, Compressive strength

1. INTODUCTION

Reduction of environmental pollution, contamination is main concern for the world. In order to reduce pollution and contamination of environment, reuse of treated wastewater has to be practiced where ever they are fit in various industries. Considerable research was carried or being carried out on reuse of solid industrial waste but reuse of treated wastewater not got significant attention in construction industry [1-3]. The literature search indicates that, not much research work was carried out on the non potable water in construction industry. An estimated annual production of 250 billion bricks per year in India, and is the second largest brick producer globally [4]. Industrial wastes, depending on their composition, may be used in brick making industry to reduce firing temperature, to modify plasticity of the locally available soil or as a filler material in the brick earth. But, regular parties are that potable water is being used in construction industry for various works. Huge volume of potable water is required in brick industry. Hence, in this investigation an attempt has been made to use the treated domestic wastewater in bricks manufacturing. This will result to get sustainable development.

2. MATERIALS AND METHODS

2.1. Soil

Bricks were made with locally available soil. The soil consists of 51% of sand and 47% of silt and clay sized particles. Its liquid limit is 30%. Plasticity index 16.5% and pH 7.11. The soil may be classified as clayey sand as per the Indian Standard Soil Classification System [5].

2.2 Water

Potable water (Reference bricks) and treated domestic wastewater (Test bricks) were used in bricks. Treated domestic wastewater collected from domestic wastewater treatment plant in Vishnu educational society, Vishnupur, Bhimavaram, Andhra Pradesh. Plant has been treating 2000 kL/day. The characteristics of treated domestic wastewater were pH 7.2, Total solids 15 mg/L, Total inorganic solids 10 mg/L. and for potable water were pH 7.1, Total solids 10 mg/L, Total inorganic solids 7 mg/L. TDWW and PW characteristics were determined in laboratory as per procedure described [6].

2.3. Methods

In order to study the possibility of use of treated domestic wastewater in bricks, potable water(reference bricks)) and Treated domestic wastewater(Test bricks) were added to these soil mixes so as to produce a homogeneous paste having enough consistency to mould it into the brick shape by hand. Bricks of size 19cm x 9cm x 9cm were fabricated from these pastes using hand moulding and soft extrusion technologies as carried out in the brick making industry. The reference and test bricks were air dried for 7 days under shade and burnt at 800^0C in muffle furnace. The test performed on burnt bricks were efflorescence test, water absorption test and compressive strength test as per I.S: 3495-1976 (Part I to IV)[7] . Each test was conducted on at least five bricks and their average values were taken for design. The plasticity of a good brick earth should lie between 15% and 25% (IS: 2117-1975)[8].

Table 1: plasticity properties of soil

S.No	Mixing water in soil	Liquid Limit	Plastic limit	Plasticity index
1	PW	30	13.5	16.5
	TDWW	30.2	13.8	16.4
	25%TDWW+75PW	30.1	13.6	16.5
	50%TDWW+50PW	30.2	13.9	16.3
	75%TDWW+25PW	30.0	13.5	16.5

3. RESULTS AND DISCUSSION

3.1 Influence TDWW on water Adsorption

Water absorption of bricks is shown in Table.1. Water adsorption due to use of treated domestic wastewater and potable water in bricks, is almost same.The water absorption of bricks was 12.2%, 12.3%, 12.4% 12.2%,12.2% for PW, TDWW, 25%TDWW+75PW,

50%TDWW+50PW, 75%TDWW+25PW respectively. According to I.S: 3495 (1976) [7] for the bricks of class up to 12.5 N/ mm^2, the water absorption should be less than 20% by weight. Hence, it reveals that almost no difference between TDWW and PW in water absorption.

Table: 2 Physical Properties of bricks

S.No	Mixing water in soil	Water absorption (%)	Compressive strength MPa	Efflorescence
1	PW	12.2	11.8	Nil
	TDWW	12.3	11.7	Nil
	25%TDWW+75PW	12.4	11.7	Nil
	50%TDWW+50PW	12.2	11.8	Nil
	75%TDWW+25PW	12.2	11.8	Nil

3.2. Influence of Sludge on Compressive Strength

Compressive strength of the bricks is shown in Table.2. Result in table.2 shows that compressive strength of bricks made with PW and TDWW is almost same. The compressive strength of bricks was 11.8, 11.7, 11.7, 11.8, 11.8 MPa for PW, TDWW, 25%TDWW+75PW, 50%TDWW+50PW, 75%TDWW+25PW respectively. Hence, TDWW was given same performance in compressive strength as PW. No efflorescence was appeared on bricks due to use of TDWW.

CONCLUSION

From this experimental study, the following conclusion can be drawn.

- Water absorption is same in PW and TDWW which is less than 20% as per I.S: 3495 (1976).
- Compressive strength is almost same in bricks made with PW and TDWW
- No efflorescence appeared on bricks due to use of treated domestic wastewater
- Treated domestic wastewater may be recommended to use in making of bricks.

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