DAFTAR PUSTAKA

Allen J. R. L. 1984. *Sedimentary Structures: Their Character and Physical Basis*. Amsterdam : Elsevier

Alzwar. M., dkk. 1998. *Pengantar Dasar Ilmu Gunung Api*. Bandung : Penerbit NOVA

Asdak, Chay. 1995. *Hidrologi dan Pengelolaan Daerah Aliran Sungai.* Yogyakarta : Gadjah Mada University Press

Bowles, J. 1984. *Sifat-Sifat Fisis dan Geoteknis Tanah (Mekanika Tanah) Edisi Kedua*. Jakarta : Erlangga

Braja M, Das. 1993. *Mekanika Tanah (Prinsip-Prinsip Rekayasa Geoteknis) Jilid 2*. Jakarta : Erlangga

Braja M, Das. 1995. *Mekanika Tanah 1*. Jakarta : Erlangga.

Chandra, Budiman. 2007. *Pengantar Kesehatan Lingkungan Cetakan Pertama*. Jakarta : EGC.

Chow, V. T, *et. al*. 1988. *Applied Hydrology*. New York : McGraw-Hill

Damanhuri, E. 1990. *Penelitian Pemilihan Lokasi Tempat Pembuangan Akhir (TPA) Sampah Tepat Guna*. Bandung : Institut Teknologi Bandung

Damanhuri. 2008. *Diktat Landfilling Limbah*. Bandung : Institut Teknologi Bandung..

Damanhuri. 2010. *Diktat Pengelolaan Sampah*. Bandung : Institut Teknologi Bandung

Djaja, Willyan. 2008. *Langkah Jitu Kompos dari Kotoran Ternak dan Sampah*. Jakarta : Agro Media Pustaka.

Dune, T & Leopold, L.B. 1978. *Water and Environment Planning*. San Farnsisco : W.H. Freeman and Co

E. J. Bowles. 1989. *Sifat-sifat Fisis dan Geoteknis Tanah*. Jakarta : Erlangga

Eagleson, P. S. 1970. *Dynamic Hydrology*. New York : Mc Graw-Hill.

ment Agency. 2011. *Earthworks in Landfill Engineering*. *Environment gency*, Bristol : LFE 4

Environmental Protection Agency. 2000. *Landfill Manuals, Landfill Site Design*. Ireland : Johnstown Castle Estate

H.C, Hardiyatmo. 2002. *Mekanika Tanah I*. Jakarta : Gramedia Pustaka Utama

Hadiwiyoto, S. 1983. *Penanganan dan Pemanfaatan Sampah*.. Jakarta : Yayasan Idayu

Haga, K. 1990. Production Of Compost From Organic Waste. Extension Bulletin N0. 321 Food And Fertilizer Tech. Center For The ASPAC Region, Taipei

Harianto, Tri. 2008. *Study On Innovative Multi-Layer Design Of Landfill Cover Barrier Layer*. Japan : Saga University

Linsley. 1982. *Applied Hydrology.* New Delhi : McGraw Hill Publ. Co. Ltd.

Metcalf dan Eddy. 1991. *Wastewater Engineering : Treatment, Disposal, and Reuse.* Singapore : McGrawHill Book Co.

Mukono. 2006. *Prinsip Dasar Kesehatan Lingkungan*. Surabaya : Airlangga University Press.

O'Leary, P., Walsh, P. 1993. *Solid Waste Landfill Correspondence Course*. Madison : University of Winconsin-Madison

Pratomo, M. Satrio. 2012. *Karakteristik Campuran Kompos Dan Tanah Kelanauan Sebagai Material Alternatif Tanah Penutup Landfill TPA Cipayung.* Depok : Universitas Indonesia

Ryadi, A. L. Slamet. 1986. *Pengantar Kesehatan Lingkungan*. Surabaya : Karya Anda.

Sallberg, J. R. 1965. *Shear Strength In Methods of Soil Analysis*. United States : Texas A and M Press

Sarsby, Robert W. 2013. *Environmental Geotechnics Second Edition*. London : ICE Publishing

SNI 03-1968-1990. *Analisis Saringan Agregat Halus dan Kasar*.

SNI 1745-2008. *Uji Kepadatan Ringan Tanah*.

...454-2002. *Tata Cara Teknik Operasional Sampah Perkotaan*.

... -1990. *Uji Berat Jenis Tanah*.

...-1990. *Kadar Air Tanah*.

...030-2004. *Spesifikasi Kompos dar Sampah Organik Domestik*.

SNI 3422:2008. Cara Uji Penentuan Batas Susut Tanah.

SNI 3638:2012. *Metode Uji Kuat Tekan-Bebas Tanah Kohesif.*

Soemarwoto, O. 1985. *Lingkungan Hidup Dan Pembangunan*. Jakarta : Djambatan

Sumantri, Arif. 2010. *Kesehatan Lingkungan & Perspektif Islam*. Jakarta : Kencana

Tchobanoglous, G., *et. al.* 1993. *Integrated Solid Waste Management*. New York : McGrawHill Inc.

Triwibowo, C. dan Pusphandani, ME. 2015. *Pengantar Dasar Ilmu Kesehatan Masyarakat*. Yogyakarta : Nuha Medika.

United States Department of Agriculture. 1999. *Agricultural Statistics Annual.* Uniterd States : USDA

United States Department of Agriculture. 2006. *Natural Resources Conservation Service*. Georgia : USDA

Verhoef, P. N. W. 1989. *Geologi untuk Teknik Sipil*. Jakarta : Penerbit Erlangga

Lampiran 1 Dokumentasi Pengambilan Data

Proses Pengambilan Sampel di TPA Tamangapa

Proses Pengujian Sampel di Laboratorium Mekanika Tanah


Maspion
600W
ELECTRIC STOVE

The above properties dominate the choice, but the following properties are also very important and must be considered:

d) Plasticity.
e) Workability.
f) Low frost susceptibility.
g) Adequate chemical resistance.
h) Low dispersivity.
i) Adequate attenuation/retardation capacity.

To select acceptable materials initially they should comply generally with the parameters in Table 4:

Table 4: Typical clay liner or cap properties

Property	"Minimum" Requirement	Test
Permeability/ Hydraulic conductivity	See your environmental Permit	BS1377 : 1990 , Part 6 : Method 6
Remoulded undrained shear strength	Typically ≥ 50 kN/m^2 or other site specifically defined value	BS1377 : 1990, Part 7 : Method 8
Plasticity index (I_p)	10% ≤ I_P ≤ 65%	BS1377:1990:Part 2: Methods 4.3 and 5.3
Liquid Limit	≤ 90%	
Percentage fines <0.063 mm (63 μm)	≥ 20 % but with a minimum clay content (particles < 2 μm) of 8 %.	BS1377 : 1990, Part 2 : Method 9.2, 9.5
Percentage gravel > 5 mm	≤ 30%	
Maximum particle (stone) size	2/3rd compacted layer thickness Typically 125 mm but must not prejudice the liner, for instance by larger particles sticking together to form larger lumps.	

Processing of the material will be necessary where the as-dug material is not acceptable, or if you're doubtful as to the acceptability of the material, for example because of any of the following:

a. Stone content too high.
b. Clay content too low .
c. Clod size too large – destructive trial required to determine size reduction possible.
d. Mudrock - breaking down required.
e. Clay is too dry therefore significant water addition required.
f. Clay is too wet therefore reduction in moisture content is required.
g. Two or more materials are to be mixed and blended.

You should detail your proposed processing specification and methodology in your method statement and QA/QC procedures. Your quality testing must extend to include any material ...arry out.

TABLE 6.1: **SOIL CLASSIFICATION TESTS**

Test	Standard
Moisture content	BS 1377 : Part 2, Section 3 : 1990
Atterberg limits (liquid limit, plastic limit, plasticity index)	BS 1377 : Part 2, Sections 4, 5: 1990
Particle density (specific gravity)	BS 1377 : Part 2, Section 8 : 1990
Particle size distribution	BS 1377 : Part 2, Section 9 : 1990
Maximum dry density/optimum moisture content relationship	BS 1377 : Part 4, Section 3 : 1990
Hydraulic conductivity	BS 1377 : Part 6, Section 6 : 1990
Organic matter content	BS 1377 : Part 3, Section 3 : 1990

TABLE 6.2: **TYPICAL SUITABLE RANGES FOR PARAMETERS OF CLAY**

Property	Range	Comment
Percentage fines (particles less than 0.075mm)	≥ 20%	A high clay content or a high silt and clay content will have a low hydraulic conductivity.
Percentage gravel (particles greater than 4.76mm)	≤ 30 %	
Plasticity Index	10 - 30 %	Soils with low plasticity index are unlikely to achieve a sufficiently low permeability. Highly plastic soils tend to shrink and crack on drying while they are very sticky when the soil is wet and are therefore hard to work with in the field.
Maximum particle size	25 - 50 mm	The particle size distribution curve should consist of well graded materials as these will tend to compact to a lower hydraulic conductivity. The particle size must not affect liner integrity.

The degree of compaction required for placement and the placement moisture content should be determined in association with permeability tests. The design should specify a range of moisture contents and corresponding soil densities (percent compaction) that are considered appropriate to achieve the required hydraulic conductivity.

The lower moisture content should be dictated by the permeability requirement. The upper limit to the moisture content may be dictated by the shear strength of the clay; because although the permeability requirement may be met, handling, compaction and trafficking become more difficult. This, in conjunction with stability considerations, dictates the requirements for a minimum shear strength. Typically an undrained shear strength (Cu) of no less than 40kN/m² is required.

The *in situ* density may be determined by nuclear density meter, core cutter or sand replacement method in accordance with BS 1377 : Part 9 : 1990.
be noted that the nuclear density meter
permit from the Radiological Protection
Ireland. To ensure the material is within
ed moisture content prior to placement the
Condition Value (MCV) test (BS 1377 :
90) may be used.

6.3.6 QUALITY ASSURANCE TESTING

Quality assurance and quality control needs to be carried out to:

- verify that construction materials are adequate;
- verify that the compaction process is adequate; and
- to ensure that the surface of the clay layer is smooth enough to prevent mechanical damage to the flexible membrane liner.

A quality assurance plan should provide details of tests, test frequencies, etc..

The following sections provide recommended minimum frequency testing for borrow sources and for soil lifts when the material is placed loosely and when compacted. Also provided is recommended maximum allowable variations for the loosely placed soil and the compacted soil. In addition to minimum frequency testing continuous observation of the construction process is required by the quality engineer, who may also prescribe or require further testing. Test samples may be taken at random or from a regular grid system.

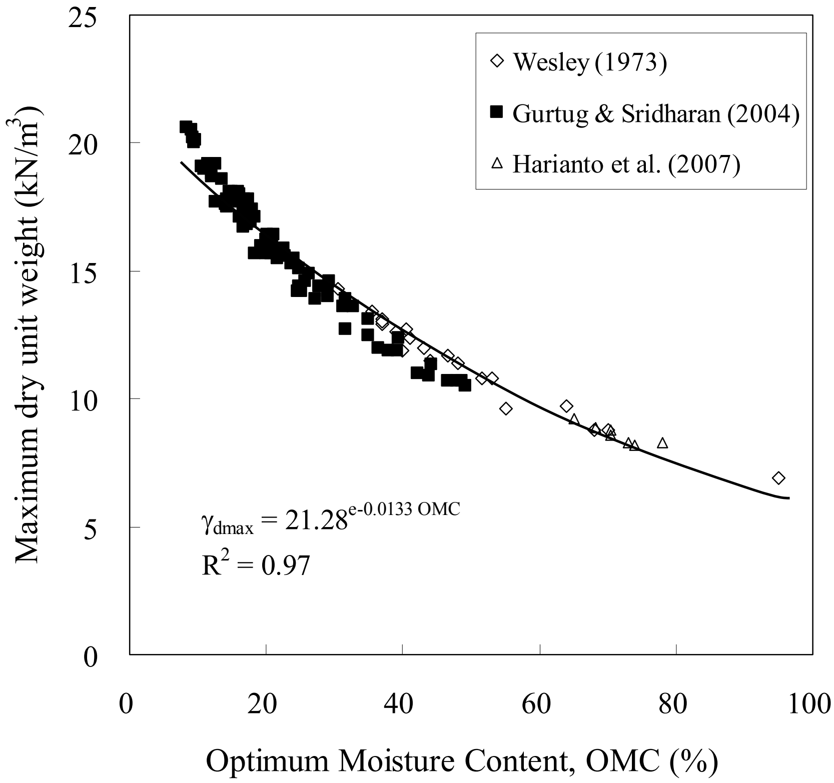

Figure 3.15 Comparison of OMC-maximum dry unit weight relationship based on the present study and selected published literature data

3.4.2 Unconfined Compressive Strength

The unconfined compression test shows that the fiber additives have a significant effect on the stress-strain behavior of the soil-fiber mixture. Figure 3.16 shows the relation between the compressive stress and axial strain (ε) of soil-fiber mixtures tested. The variation of q_u and ε_f with various fiber contents are showed in Figure 3.17. The addition of fibers increased the peak stress and ductility of the soil specimen. The values of q_u and ε_f of the soil specimens are given in Table 3.4. For any FC studied, the q_u increased and reach a peak value at FC = 1.0%, and then decreased at FC = 1.2 %. The maximum value of q_u (FC = 1.0%) increased about 80% as compared with FC = 0%. The mechanism that fiber inclusion increased the shear strength of soil-fiber mixture could be explained by the development of interfacial force and interlock between soil particles and fibers. The total … between soil particles and fibers increased with the increase in the FC, which … to the increase in the resistance to externally applied forces, and consequently … of the soil-fiber mixtures increases.

Table 3.4 Value of q_u and ε_f for various fiber contents

Fiber content (%)	Compression test	
	q_u (kN/m^2)	ε_f(%)
0.0	46.02	2.2
0.2	61.82	3.0
0.4	63.98	3.2
0.6	65.61	3.6
0.8	69.48	3.8
1.0	82.54	4.4
1.2	75.52	4.2

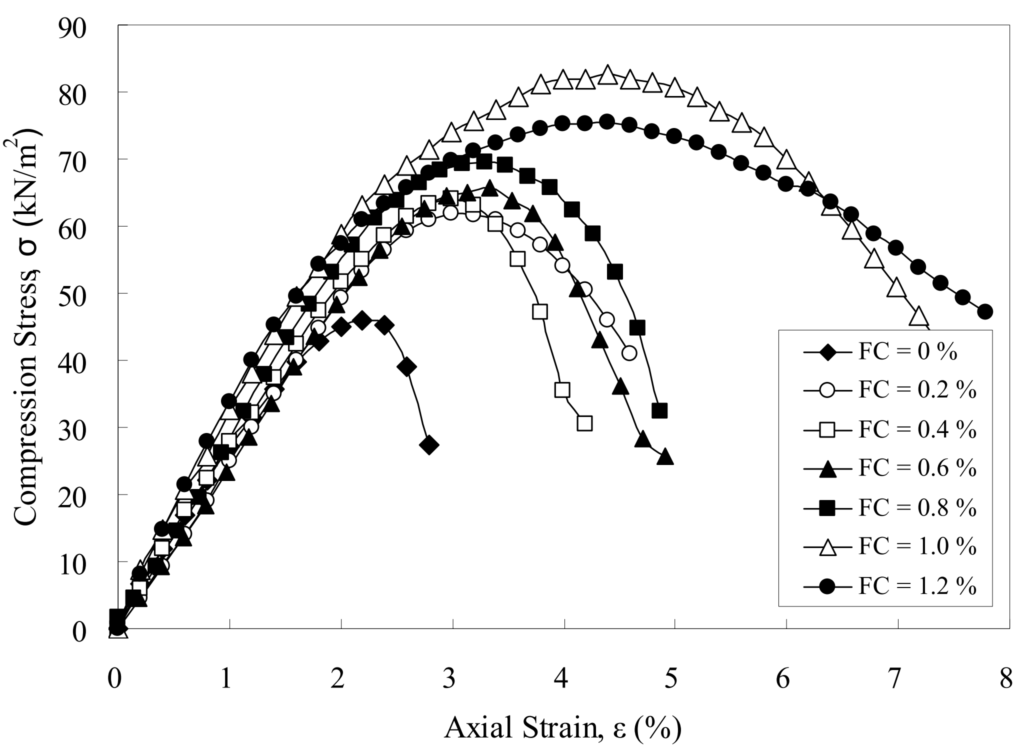

Figure 3.16 Stress-strain curves of Akaboku soil with various fiber contents

Furthermore, in the Figure 3.17, the soil-fiber mixtures exhibited a highly ductile behavior which is indicated by less loss of peak strength and larger ε_f value. The similar trend with the q_u is shown for the ε_f at various FC. With increase in FC, the ε_f increased up to FC = 1.0%, and slightly decreased with FC = 1.2%. This behavior can be attributed to the increased in the bonding resistance with the increase in FC. However, at FC = 1.2%, the effective interface contact between the soil particle and the fiber would be less. Therefore, the q_u and ε_f tend to decrease. The above observation indicates an improvement of the mechanical properties that the soil-fiber mixtures are able to hold more deformation and higher strain at rupture.

The elasticity modulus (E) is often used to characterize the stiffness of the soil. The relationship between the E_{50} and FC were plotted in Figure 3.18. At the FC $\leq$ 0.6%, the lower stiffness value was found compared to the soil with FC = 0%. On the other hand, when the FC = 0.8% or above, the higher q_u tends to be associated with higher secant modulus, and the stiffness became higher and the stress-strain curves changes became more ductile behavior. It can be concluded that in terms of the stiffness and ductile behavior with different FC, the effectiveness of the fiber additive was found for the FC $\geq$ 0.8%.

Figure 3.19 shows the normalized stress-strain curve of the soils at different FC. From the normalized stress-strain curves, the values of *TI* were determined for soils at various FC. The $f\,(\varepsilon')$ equations of each FC curve were tabulated in Table 3.5. Figure 3.20 shows the Toughness Index (*TI*) of the Akaboku soil with various FC. It can be seen that the *TI* increased as the FC increases. Initially, a slightly increase of the *TI* occurred up to FC = 0.8% and significantly increased for the FC > 0.8%. This result indicated that the soil-fiber mixtures can absorb much energy against induced strain, and subsequently the stress-strain curves change to a ductile behavior.

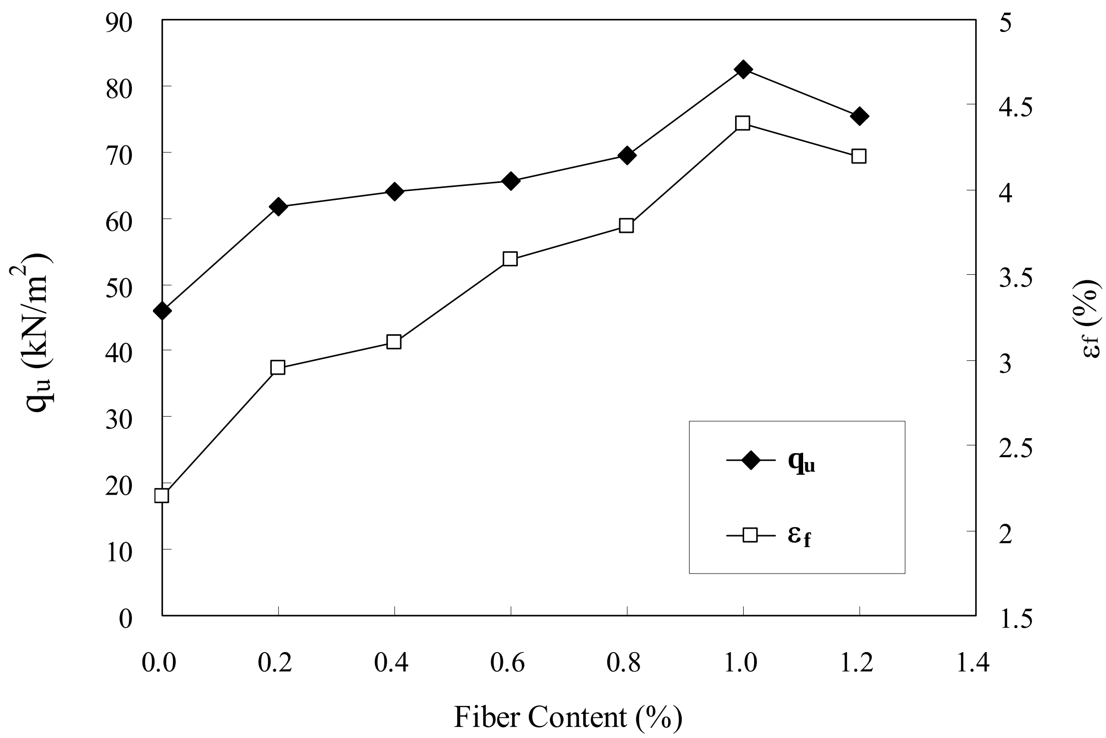

Figure 3.17 Variation of strength and strain with various fiber contents

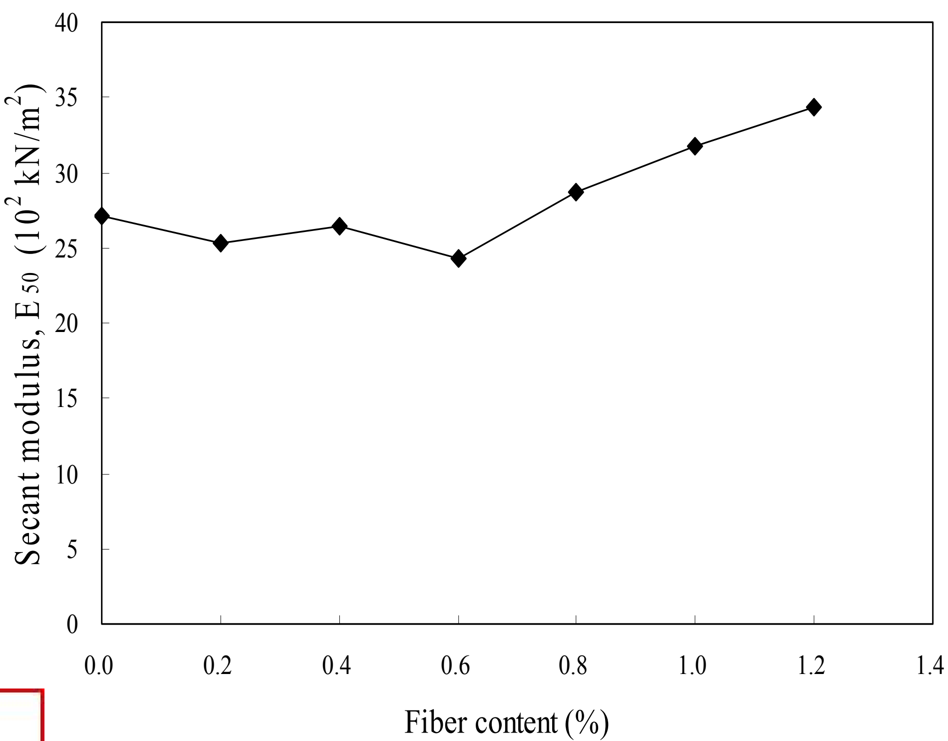

Figure 3.18 Variation of modulus elasticity (E_{50}) for various fiber contents

Table 3.5 The equation of $f(\varepsilon')$ for various fiber contents

Fiber content (%)	$f(\varepsilon')$
0.0	$-2.98x^6 + 9.65x^5 - 12.79x^4 + 8.29x^3 - 2.91x^2 + 1.74x + 0.0012$
0.2	$-1.15x^3 + 1.22x^2 + 0.89x + 0.0056$
0.4	$-1.20x^3 + 1.16x^2 + 1.01x + 0.0293$
0.6	$-1.37x^3 + 1.60x^2 + 0.78x - 0.0227$
0.8	$-0.99x^3 + 0.75x^2 + 1.31x - 0.0511$
1.0	$-0.03x^3 - 0.95x^2 + 1.98x + 0.0027$
1.2	$0.26x^3 - 1.52x^2 + 2.25x - 0.0005$

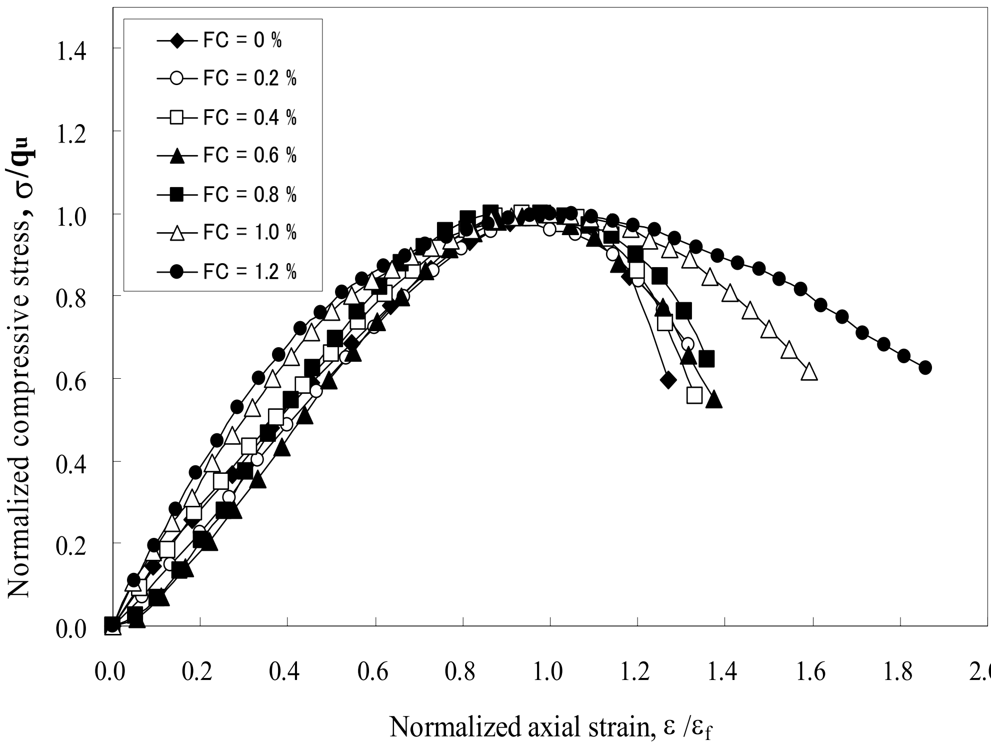

Figure 3.19 Normalized stress-strain curve

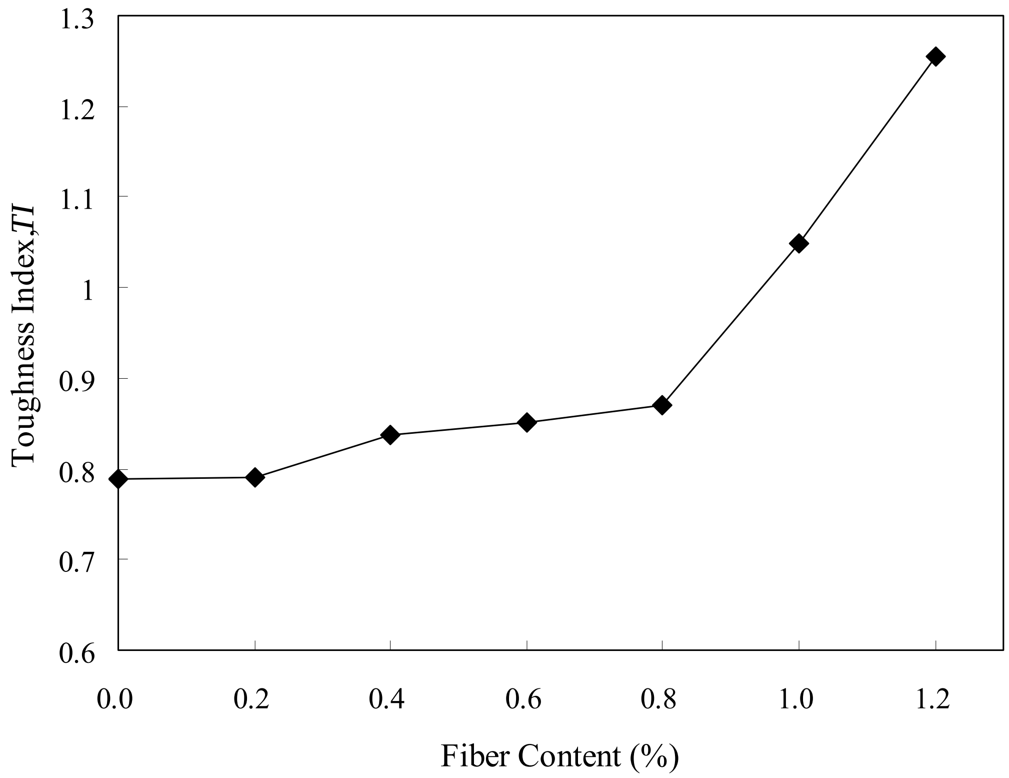

Figure 3.20 Toughness index with various fiber contents

3.4.3 Tensile Strength

The tensile strength (σ_T) behavior at different FC indicated that the inclusion of fibers increased the σ_T of the soil as shown in Figure 3.21. The results of the tensile test with various FC are summarized in Table 3.6. Initially σ_T increased up to FC = 1.0% and decreased for FC = 1.2%. The results indicated that for the FC used, the value of σ_T varied between 9.53 (FC = 0%) and 27.53 kN/m^2 (FC = 1.0%) and was found increased by 240% as compared to natural soil. This trend is similar to the unconfined compression test result in the previous section.

veness of fiber additives depends on the interaction between fibers and soil. nism of the fibers interacts to the Akaboku soil mainly controlled by the rce. When the tensile force needs to be mobilized in the fibers, such as that