การศึกษาความคงทนของกระสอบพลาสติกแบบมีปีก

DURABILITY OF PLASTIC FLAPPED SOIL BAGS

1,*, 1, 2 2
1
, , , ,
2
, , , ,
*Corresponding author address: chidpon.wo@ku.th

บทคัดย่อ

) (
)) ( )

คำสำคัญ: *กระสอบมีปีก, เม็ดพลาสติกรีไซเคิล, แผ่นวัสดุใยสังเคราะห์ ,ความคงทน*

Abstract

Landslides are extremely damaging to humans and property. The application of flapped soil bags to prevent and improve soil slope stability is one of the appropriate methods in this regard. The flapped soil bags are designed with a wing section to strengthen the bond between them, and implementation is not complicated. For long-term applications, the durability of the winged sacks is required. This research presented the results of two developed models of the winged sack: A) original flapped soil bag made of (HDPE/PP) B) flapped soil bag made of recycled plastic. The laboratory tests include tensile tests, puncture tests, effect of exposure using fluorescent UV condensation apparatus and optical microscope. The test results illustrate the long-term trend of the engineering properties of flapped soil bags in each of the above models and the limitations on the application of flapped soil bags in geotechnical engineering application.

Keywords: *flapped soil bag, recycled plastic, geotextile sheet, durability*

1. บทนำ

(
)
( )

UV 15 (
( ))
(2556)

2. วิธีวิจัย

2.1. ทฤษฎี

Matsuoka & Liu (2006)

(σ_{1f}) (σ_{3f})

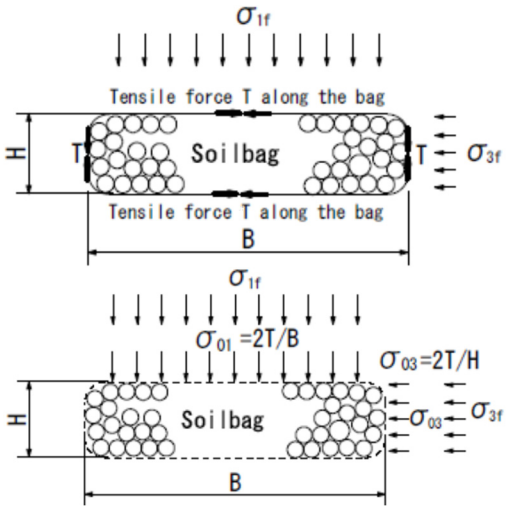
(T)

B H

1 (1)

Mohr-coloumb

$$\sigma_{1f} = \sigma_{3f}K_p + \frac{2T}{B}\left(\frac{B}{H}K_p - 1\right) \quad (1)$$



1 (Soilbag)

(Matsuoka & Liu ,(2006))

Matsuoka & Liu (2006)

Cohesion (c)

c(δ)

(Major principal stress)

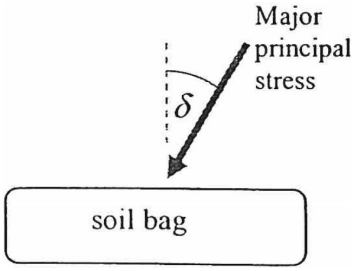
2

δ = 0

(δ = 90) c

(2)

$$c = \frac{T}{B\sqrt{K_p}}\left(\frac{B}{H}K_p - 1\right) \quad (2)$$



2 δ (Major principal stress)

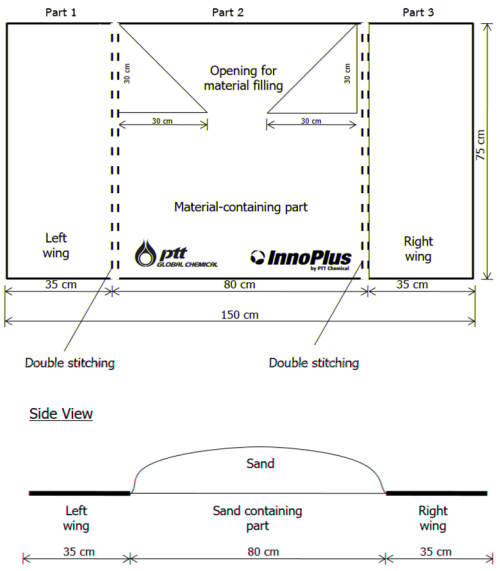
((2013))

2.2. วัสดุ

3 UV

2.2.1. กระสอบมีปีกแบบเดิม

2.2.2. กระสอบมีปีกแบบเป็นมิตรกับสิ่งแวดล้อม



3

( )

2.3. วิธีการ

2.3.1. การทดสอบหาน้ำหนักต่อหน่วย (UNIT WEIGHT)

( )
( ) ASTM D5261 GEOTEXTILES

0.01

2.3.2. การทดสอบหาค่ากำลังรับแรงดึง (TENSILE PROPERTIES)

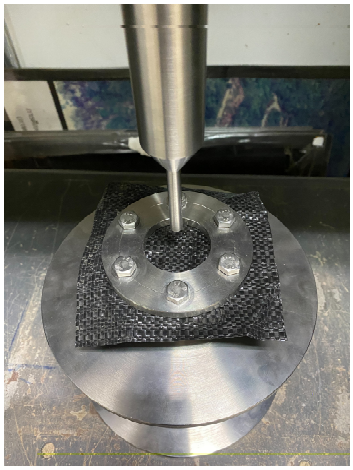
( )
( ) ASTM D882 10 (Machine Direction , MD) 5 (Cross-Machine Direction , CD) 5 25.4 101.6 4 150



4

2.3.3. การทดสอบหาค่ากำลังต้านทานการเจาะทะลุ (PIN PUNCTURE RESISTANCE)

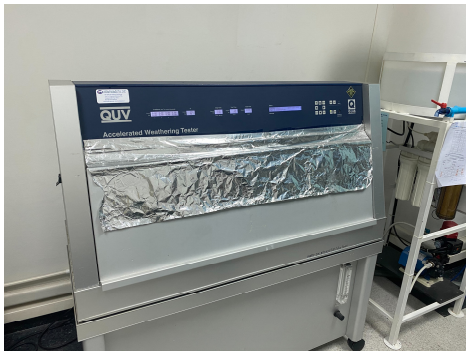
Geotextile ASTM D4833 127 x 127 (Ring Clamp) 45 8 (Chamfer) 0.8 5 150



5

2.3.4. การทดสอบความทนต่อสภาวะแวดล้อมโดยวิธีเร่งสภาวะ (EFFECT OF EXPOSURE OF UNREINFORCED POLYOLEFIN GEOMEMBRANE USING FLUORES-CENT UV CONDENSATION APPA-RATUS)

ASTM D7238 QUV 6 0.78 340 20 75 4 20 5 (MD) (MD)



6

2.3.5. การส่องกล้องจุลทรรศน์แบบใช้แสง(OPTICAL MICROSCOPE)

1 , 94 2063

20

1

20

5

3. ผลการทดสอบ

3.1. ผลการทดสอบหาน้ำหนักต่อหน่วย(UNIT WEIGHT)

1

2

1

Original flapped soil bag made of (HDPE/PP)			
Age (days)	Unit weight (g/m^2)		
	Tensile tests	Puncture tests	Average
1	165.85 (S.D.=1.63)	164.05 (S.D.=3.21)	165.25 (S.D.=2.33)
94*	180.58 (S.D.=2)	179.06 (S.D.=4.26)	180.07 (S.D.=2.88)
2063**	168.18 (S.D.=4.17)	169.88 (S.D.=7.18)	168.74 (S.D.=5.15)

*

94

. . .

**

5 8

. . . (, 2560)

2

Flapped soil bags type	Age (days)	Unit weight (g/m^2)
A) original flapped soil bag made of (HDPE/PP)	1	165.85 (S.D.=1.63)
	20*	165.08 (S.D.=2.12)
B) flapped soil bag made of recycled plastic	1	155.39 (S.D.=2.86)
	20*	155.00 (S.D.=2.74)

*

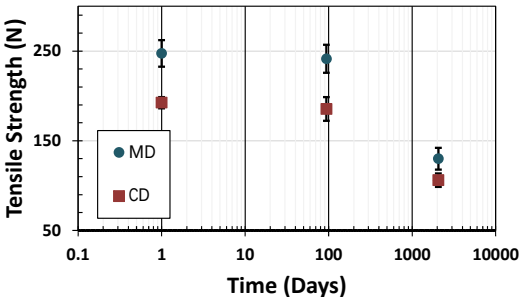
3.2. ผลการทดสอบหาค่ากำลังรับแรงดึง(TENSILE PROPERTIES)

(MD) (CD)

94

2,063

7



7

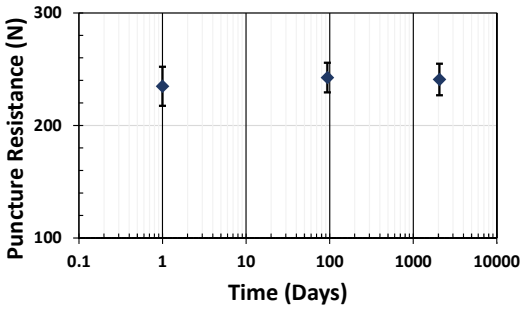
(MD)

(CD)

3.3. ผลการทดสอบหาค่ากำลังต้านทานการเจาะทะลุ (PIN PUNCTURE RESISTANCE)

94 2063

8



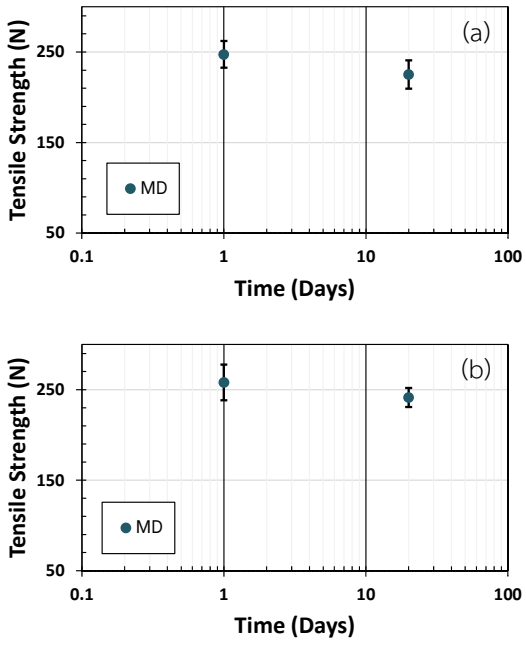
8

3.4. ผลการทดสอบการเร่งสภาวะในห้องปฏิบัติการ(EFFECT OF EXPOSURE USING FLUORESCENT UV CONDENSATION APPARATUS)

20

(MD)

9



9 1

20

(a)

(MD) (b)

(MD)

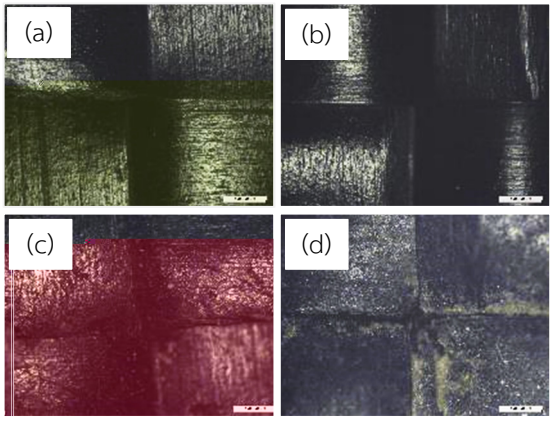
3.5. ผลการส่องกล้องจุลทรรศน์แบบใช้แสง(OPTICAL MICROSCOPE)

5

2,063

20

10 11

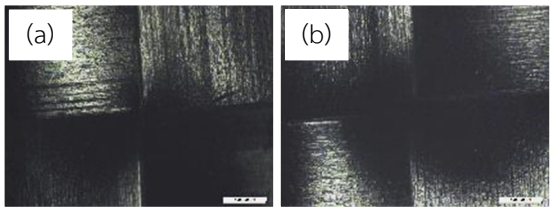


10 5 (a)

1 (b) 20 (c)

94 (d)

2063



11 5

(a) 1 (b)

20

4. วิจารณ์และสรุปผล

(MD) 2% 47%

94 2063

(CD) 4% 45%

94 2063

Cohesion Matsuoka & Liu (2006)

(2) 80

15 (Ø=30)
Cohesion 3

20
9% 6%
Cohesion Matsuoka & Liu (2006) Cohesion 4

(3 %) 2063

3 Cohesion Matsuoka & Liu ( )

Flapped soil bags type		Age (days)	Cohesion (kPa)
A) original flapped soil bag made of (HDPE/PP)	MD	1	20.29
		94	19.80
		2063	10.66
	CD	1	15.78
		94	15.21
		2063	8.71
B) flapped soil bag made of recycled plastic	MD	1	21.16
	CD	1	16.50

4 Cohesion Matsuoka & Liu ( )

Flapped soil bags type		Age (days)	Cohesion (kPa)
A) original flapped soil bag made of (HDPE/PP)	MD	1	20.29
		20	18.47
B) flapped soil bag made of recycled plastic	MD	1	21.16
		20	19.80

5. กิตติกรรมประกาศ

( )

6. การอ้างอิง

[1] ASTM. (2020). *Standard Test Method for Index Puncture Resistance of Geomembranes and Related Products.* American Society for Testing and Materials International, West Conshohocken, PA.

[2] , , , , , , (2562) . . . *การประชุมวิชาการวิศวกรรมโยธาแห่งชาติ ครั้งที่ 24* 10-12 2562 .

[3] ASTM. (2019). *Standard Test Method for Tensile Properties of Thin Plastic Sheeting.* American Society for Testing and Materials International, West Conshohocken, PA.

[4] ASTM. (2018). *Standard Test Method for Measuring Mass per Unit Area of Geotextiles.* American Society for Testing and Materials International, West Conshohocken, PA.

[5] ASTM. (2017). *Standard Test Method for Effect of Exposure of Unreinforced Polyolefin Geomembrane Using Fluorescent UV Condensation Apparatus.* American Society for Testing and Materials International, West Conshohocken, PA.

[6] Jotisankasa A., Pornpongphatthana K., Vijittpokin S., Wongsakulkiat C., Praphatsorn, W. and Angkanawisalya, K. (2017).Engineering characteristic of flapped soilbags. *Proceedings of 10 th AUN/SEED-Net Regional conference on Geological and Geo-Resource Engineering,* August 2-3, Phom Penh, Cambodia.

[7] Jotisankasa, A. (2013). *Soil-bioengineering: Use of vegetation and soil engineering for erosion control and slope stabilization.* Pree-One, Bangkok, BKK, TH, 244-246.

[8] Matsuoka H, Liu, S. (2006). *A new earth reinforcement method using soilbags.* Taylor & Francis, London, LDN, UK, 17-25.