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Evaluation of Ecocycle Netting for Erosion Control Applications

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16. Abstract

Conweds's Ecocycle netting was introduced to the Wisconsin Department of Transportation as netting for rolled erosion control blankets (RECP) that will degrade over time by three different mechanisms. First mechanism is UV exposure, second is oxidation and temperature, and the third is by biodegradation. This would help eliminate excess material on the department's right of way that may be problematic for long term maintenance operations such as mowing or future excavations. This netting was submitted for inclusion into the department's list as standard netting on RECPs.

It was found by the department that RECPs containing Ecocycle netting are an acceptable alternative used in products that are listed in the department's pre-approved Class I Type A and B erosion mats. Recommendation that, no restriction on installation time of year be instituted, and that performance retest requirement for pre-approved Class I Type A and B erosion mats not be required. This would be restricted to equal substitution of an Ecocycle netting of similar dimensions to original netting configuration as submitted to the department.

The Ecocycle netting looses significant tensile strength as purported by Conwed during the summer as exhibited by this study. Further evaluation will be needed to determine the nettings overall longevity past its useful life as it relates to Wisconsin's environment.

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Introduction

Rolled erosion control products (RECP) are used on the Wisconsin Department of Transportation's projects to control erosion in both channels and on slopes after final grading and topsoiling operations are complete. As a component of the short term temporary degradable blankets, plastic netting of varying composition is used in conjunction with stitching to hold the parent material, typically straw or wood excelsior in place within the matrix of the RECP.

Netting that has no UV accelerant as part of the composition is not restricted on the time of application. UV accelerated blankets classified as photodegradable are restricted from installation after September 1st of any given year. This is based upon the expected life of the rapid degrading netting. These products have a design life expectancy of 6 to 8 weeks. After this time has passed the products exhibit loss in strength and structural integrity. Proper time must be allowed for these products to establish vegetation prior to winter months. It has been shown empirically that products installed after the September 1st deadline will not perform through the winter months and the following spring to allow vegetation to be established.

Conweds' Ecocycle netting was introduced to the department as netting that will degrade over time by three different mechanisms. First mechanism is UV exposure, second is oxidation and temperature, and the third is by biodegradation. This would help eliminate excess material on the department's right of way that may be problematic for long term maintenance operations such as mowing or future excavations. This netting was submitted for inclusion into the department's list as standard netting on RECPs.

Evaluation

The Ecocycle netting's life expectancy was evaluated to ensure that any exhibited loss in strength and structural integrity would not impact the overall products ability to protect the slope or channel from erosion initiated by the spring snow melt or rains when the product was installed in the late fall. Conwed, the producer of Ecocycle netting, provided the department with test results showing the degradation mechanism of the material when exposed to heat and light. Conwed claims were that in a cold snow covered or partially covered condition, the degradation of the material would be negligible.

A section of both slope and channel were selected from one of the department's construction projects. A control sample, Product A with standard polypropylene netting, which is approved for use, was compared to Product A with Ecocycle netting. Products were installed in November of 2009 side by side for equal environmental exposure. This would allow for a comparison of the material in the spring.

Samples were taken of the material in March of 2010, after the slopes were allowed to establish initial vegetation.

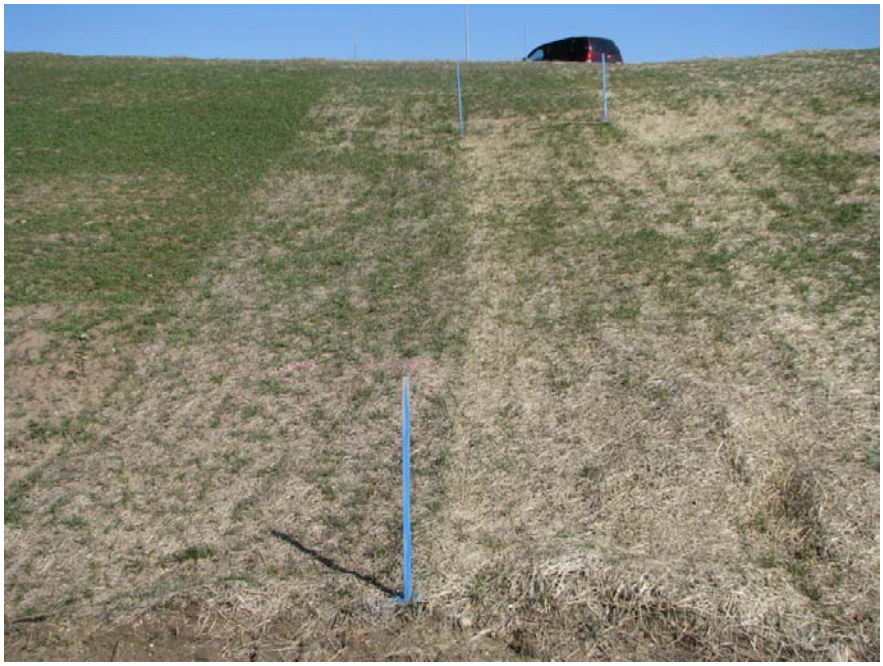

Figure 1: Slope installation of Product A with and without Ecocycle netting.

Figure 2: Channel installation of Product A with and without Ecocycle netting.

In addition to the department controlled study, samples were taken from a commercial site on October 2, 2009 of Product B with Ecocycle after approximately 3 months of summer exposure. This was compared to a non-exposed Product B with standard polypropylene netting to give a base line of typical product degradation in harsher UV and temperature conditions.

Figure 3: Installation of Product B with Ecocycle netting

Ecocycle Non-Exposed Sample (2.75 in specimen)				
	Bottom		Top	
	Machine (N)	Transverse (N)	Machine (N)	Transverse (N)
			62	22
			62	44
			62	44
			62	31
			58	36
	49	49	62	49
	49	44	62	44
	58	44	49	27
N	52	46	60	37
N/m	744	654	857	531
lb/ft	51	45	59	36

Table 1: Non-exposed control for Summer UV exposure, comparative tensile strengths

Ecocycle Exposed Sample (2.75 in specimen)				
	Bottom		Top	
	Machine (N)	Transverse (N)*	Machine (N)	Transverse (N)
	(* specimans cut to 2 inch width)		31	33
			31	29
	40	31	21	36
	36	36	40	31
N	38	34	31	32
N/m	544	480	440	462
lb/ft	37	33	30	32

Table 2: Summer UV exposure, comparative tensile strengths 2009

As shown in Table 2, the samples lost strength over the summer as expected due to temperature, UV exposure and oxidation. The average overall tensile strength reduction was 37% when both the machine direction and transverse direction top and bottom netting were considered. The largest strength loss, 49%, was experienced in the top netting in the machine direction. The overall average top net tensile strength loss was 47%.

Standard Exposed Sample			Exposed Ecocycle Sample	
	Top		Top	
	Machine (N)	Transverse (N)	Machine (N)	Transverse (N)
	178	102		
	147	111		
	89	107	102	89
	116	133	80	80
N	133	113	91	85
N/m	652	557	448	416
lb/ft	45	38	31	28

Table 3: Values for overwintering exposure, comparative tensile strengths 2010

The installations from November of 2009 were allowed to overwinter until March 23rd of 2010. Samples were taken from both insitu control and Ecocycle products, Figure 1 and Figure 2 show the sample locations. As shown in Table 3 the Ecocycle netting did experience greater tensile strength loss but not to degree that the summer installation experienced. The overall average tensile strength loss from the machine direction and cross direction combined on the top net was 28% greater than the standard exposed sample. The top net's greatest reduction in tensile strength was in the machine direction at 31% as compared to the standard exposed sample. The reduction in tensile strength when compared to an unexposed Ecocycle netting was 38% overall. No bottom netting was evaluated as part of the

overwintering evaluation. The unexposed control Ecocycle netting had an average strength loss of the summer exposed top netting of 49% and an average overwintering strength loss of the top net of 38%. The comparative strength loss between overwintering exposures of a standard net to an Ecocycle net was that the Ecocycle netting strength loss was 28% greater.

Based on the observed in-field installed condition, a subjective evaluation done in March 2010 by the sampling DOT representative yielded that, the netting retained enough tensile strength to withstand the spring flows.

Conclusion

RECPs containing Ecocycle netting are an acceptable alternative used in products that are listed in the department's pre-approved Class I Type A and B erosion mats. Recommendation that, no restriction on installation time of year be instituted, and that performance retest requirements for pre-approved Class I Type A and B erosion mats not be required. This would be restricted to equal substitution of an Ecocycle netting of similar dimensions to original netting configuration as submitted to the department.

The Ecocycle netting looses significant tensile strength during the summer as purported by Conwed and as demonstrated by this study. Further evaluation will be needed to determine the nettings overall longevity past its useful life as it relates to Wisconsin's environment to fully quantify the benefits of the oxo-degradation properties of the Ecocycle netting.