



**FOAM TECHNOLOGY**

**ALTERNATE DAILY COVER  
MATERIALS AND SUBTITLE D**

-

**THE SELECTION TECHNIQUE**

by  
Paul A. Kittle, Ph.D.

Rusmar Incorporated  
West Chester, PA 19380

June, 1993

# **TABLE OF CONTENTS**

**EXECUTIVE SUMMARY**

**INTRODUCTION**

**THE OBJECTIVE**

**ALTERNATE DAILY COVERS AND WHY THEY ARE USED?**

**THE RULE - SUBTITLE D**

**STEP ONE -**

**COMPARE ALTERNATE DAILY COVER MATERIALS TO THE RULE**

**Control of Disease Vectors**

**Control of Fires**

**Control of Odors**

**Control of Blowing Lifter**

**Control of Scavenging**

**STEP TWO -**

**EVALUATE THE TOTAL APPLICATION COSTS**

**STEP THREE -**

**EVALUATE THE OPERATING CHARACTERISTICS**

**STEP FOUR -**

**VENDOR EVALUATION; VERIFY CLAIMS & REFERENCES**

**STEP FIVE -**

**THE GUARANTEE**

**STEP SIX -**

**ISSUE THE PURCHASE AGREEMENT**

**REFERENCES**

# EXECUTIVE SUMMARY

It is the objective of this presentation to outline and define that the procedures used to choose an Alternate Daily Cover Material are the same procedures used to choose trash trucks, liners, leachate collection equipment, compactors, bulldozers, gas recovery systems, or anything else you may choose to purchase.

## **The main conclusions are:**

The majority of the Alternate Daily Cover Materials are used for two basic reasons: (1) they save air space; and/or (2) they conserve soil.

RCRA Subtitle D alternate daily cover regulations require control of disease vectors, fires, odors, blowing litter, and scavenging.

Most of the Alternate Daily Cover Materials perform acceptably with respect to controlling Disease Vectors as long as the materials are applied adequately and correctly. All vendors of Alternate Daily Cover Materials claim to control Disease Vectors.

There are very few of the Alternate Daily Cover Materials satisfying the "control of fire" requirement. The non-hardening foams are non-flammable, simply because they are essentially all water. The other Alternate Daily Cover Materials, tarpaulins/geotextiles, claim to be self-extinguishing or flame retardant, but these claims are not equivalent to non-flammable, and none of the tarpaulins/geotextiles claim to control fires.

The Heats of Combustion of the commonly used tarpaulins/geotextiles are equivalent to coal, coke, wood, and straw, and only slightly less than that of jet fuel, fuel oil, and gasoline.

All Alternate Daily Cover Materials claim to control odors, however, some vendors do not have evidence to support the claim.

Once installed, all the Alternate Daily Cover Materials will effectively control blowing litter.

Summary - Alternate Daily Cover Materials versus the Subtitle D Rule -

(1)The Alternate Daily Cover Material must form a continuous barrier;

- (2) The Alternate Daily Cover Material must be sealed on the edges when placed in use;
- (3) Alternate Daily Cover Materials must be non-flammable (zero or negative heat of combustion) as defined by ASTM E1 354 Cone Calorimeter test results;
- (4) Alternate Daily Cover Materials need to control odors and this performance can be defined quantitatively via ASTM E679 test results;
- (5) Post-use removal of an Alternate Daily Cover Materials can reverse any odor or non-methane hydrocarbon control benefit initially delivered; and,
- (6) Control of blowing lifter and control of scavenging can be achieved with almost any suitable Alternate Daily Cover Material.

The application cost for a Subtitle D compliant Alternate Daily Cover Material will be in the range of \$0.05/SF to \$0.15/SF depending upon the choice of materials and the thickness of the application required. Foamed Alternate Daily Cover Materials are the only choices if the Subtitle D rules are operational and the landfill operator and/or regulator wants to have the daily working face "look covered". Equipment costs for foam systems will vary between \$0.005/SF and \$0.02/SF, depending upon style of equipment chosen, working life, and total number of square feet covered.

**Rusmar Incorporated** is the only supplier of winterized Alternate Daily Cover Material equipment. The Rusmar Incorporated winterization system is patented - US Patent #5,066,428, November 19, 1991.

**Rusmar Incorporated** is the only supplier of Alternate Daily Cover Material equipment based on Caterpillar components.

**Rusmar Incorporated** is the only supplier of Alternate Daily Cover Material equipment delivering chemical concentrate in bulk; storing the chemical concentrate outside in winterized equipment; metering and diluting the chemical concentrate automatically into the Alternate Daily Cover Material foam machine.

**Rusmar Incorporated** is the only supplier of Alternate Daily Cover Material equipment not needing any post-use clean-up.

**Rusmar Incorporated** has more proven, reliable, Alternate Daily Cover Material equipment in continuous use than any other supplier. Since 1990, when Rusmar Incorporated introduced the first self-propelled Pneumatic Foam Unit, Rusmar Incorporated has foam covered more than 25 million square feet of daily working face - no one else is even close.

**Rusmar Incorporated** can provide references satisfying all operational and performance claims. These include operating and capital cost, permitting issues, regulatory opinions, training, service, support, and guarantees.

**Rusmar Incorporated** does provide a cost/performance guarantee. No other vendor of Alternate Daily Cover Material technology provides such a guarantee.

## **HEATS OF COMBUSTION OF REPRESENTATIVE MATERIALS**

### **COMMON PLASTICS (3,4,5)**

Polyethylene	46.3 MJ/Kg
Polypropylene	46.4 MJ/Kg
Polystyrene	41.4 MJ/Kg
Polyvinyl Chloride	18.0 MJ/Kg
Urea Formaldehyde Foam	15.0 MJ/Kg
Unsaturated Polyester	26.0 MJ/Kg

### **COMMON TARPAULINS/GEOTEXTILES (3)**

Cormier RPVC	14.6 MJ/Kg
Griffolyn	28.7 MJ/Kg
Sanicover	31.3 MJ/Kg
Air Space Saver	32.0 MJ/Kg
Fabrisoil	32.5 MJ/Kg
Typar	33.7 MJ/Kg

### **OTHER COMMON MATERIALS (3,4,5)**

Charcoal	34.2 MJ/Kg
Coal, Anthracite	32.8 MJ/Kg
Coal, Bituminous	30.5 MJ/Kg
Coke	29.5 MJ/Kg
Fuel Oil, #1	46.1 MJ/Kg
Gasoline	46.8 MJ/Kg
Jet Fuel, JP-4	46.6 MJ/Kg
Lignite	28.0 MJ/Kg
Paper, Newsprint	19.7 MJ/Kg
Straw	15.6 MJ/Kg
Wood, Dry, Average	20.0 MJ/Kg

**ASTM EI 354 CONE CALORIMETER  
TEST RESULTS**

<b>MATERIAL</b>	<b>IGN TIME (SECS)</b>
CORMIER RPVC	24
CARDBOARD	34
SANICOVER	42
GRIFFOLYN	43
FABRISOIL	44
TYPAR	52
AIR SPACE SAVER	77
PLYWOOD	151
PLEXIGLASS	156
RED OAK	266
DRY WALL	INFINITE

**ODOR AND HYDROCARBON EMISSION CONTROL  
FOR VARIOUS ALTERNATE DAILY COVER MATERIALS**

**SUMMARY OF RESULTS**

<b>COVER MATERIAL</b>	<b>MEASUREMENT TIMING</b>			
	<b>IMMEDIATELY</b>		<b>NEXT DAY</b>	
	<b>ODOR NMHC PERCENT CONTROL</b>			
Rusmar Foam (6")	98	100	99	100
Soil (9")	99	93	99	93
Griffolyn	99	100	99	98
Air Space Saver	100	100	99	98
Fabrisoil	82	0	82	0

# **ALTERNATE DAILY COVER MATERIALS AND SUBTITLE D - THE SELECTION TECHNIQUE**

**by**

**Paul A. Kittle, Ph.D., President, Rusmar Incorporated**

## **INTRODUCTION -**

As new technology in any field develops there are multiple interpretations as to the "answer" that will satisfy the "question". The examples abound, even in the waste business; for instance, in trash hauling: front loaders or rear loaders; landfills or incinerators, direct or indirect (transfer stations) land-filling, to mention just a few comparisons.

In general, all of the choices compete for market acceptance on the basis of conventional market forces: value and service. If there are no external forces bearing on the question, the final result is generally based on economics: operating cost of the trash truck; the distance to the landfill; the tipping fee at the landfill or the incinerator, etc.

External rules and regulations change the evaluation procedure - use of liners, leachate collection systems, times of operations, noise levels, diesel smoke emissions, odor control, liability insurance, post closure regulations, and literally thousands of other rules and regulations, limiting a strictly economic selection process.

## **THE OBJECTIVE -**

It is the objective of this presentation to outline and define that the procedures used to choose an Alternate Daily Cover Material are the same procedures used to choose trash trucks, liners, leachate collection equipment, compactors, bulldozers, gas recovery systems, or anything else you may choose to purchase.

## **ALTERNATE DAILY COVERS AND WHY THEY ARE USED?**

Currently, daily covers include soil (the standard), tarpaulins/geotextiles (three general types of materials), foams (two general types of materials), condensed phase materials (two non-foamed materials), and a variety of locally available waste (often soil-like) materials approved for daily cover on a case-by-case basis.

## **ALTERNATE DAILY COVER MATERIALS AND SUBTITLE D**

The majority of the Alternate Daily Cover Materials are used for two basic reasons: (1) they save air space; and/or (2) they conserve soil. Please note that it is generally accepted that disposing of excess soil by depositing it in a landfill is an extravagant waste of permitted air space.

### **THE RULE - SUBTITLE D -**

The RCRA Subtitle D regulations - Criteria For Municipal Solid Waste Landfills (1) become effective on October 9, 1993. Of specific interest to this presentation is paragraph 258.21, Cover Material Requirements, which state:

(a) Except as provided in paragraph (b) of this section, the owners or operators of all MSWLF units must cover disposed solid waste with six inches of earthen material at the end of each operating day, or at more frequent intervals, if necessary, to control disease vectors, fires, odors, blowing litter, and scavenging.

(b) Alternative materials of an alternative thickness (other than at least six inches of earthen material) may be approved by the Director of an approved State if the owner or operator demonstrates that the alternative material and thickness control disease vectors, fires, odors, blowing litter, and scavenging without presenting a threat to human health and the environment.

(c) The Director of an approved State may grant a temporary waiver from the requirement of paragraph (a) and (b) of this section if the owner or operator demonstrates that there are extreme seasonal climatic conditions that make meeting such requirements impractical.

### **STEP ONE -**

#### **COMPARE ALTERNATE DAILY COVER MATERIALS TO THE RULE -**

Subtitle D states clearly the basis for performance requirements for all Alternate Daily Cover Material choices - control of: disease vectors, fires, odors, blowing litter, and scavenging. Some of these performance criteria can be quantified and others are more qualitative. A brief summary follows.

#### **Control of Disease Vectors -**

The six inch soil cover rule, a general standard in most locations, is based upon an old observation that fly larvae are incapable of "escaping" through that thickness of soil.

## **ALTERNATE DAILY COVER MATERIALS AND SUBTITLE D**

In general, disease vectors are really insects - flies and mosquitos - but the application of this rule now generally includes birds, particularly sea gulls, rats, mice, and dogs.

Tarpaulins/geotextiles are obviously a barrier to flies and mosquitos, birds, rats, and, likely, most dogs, if the tarpaulins/geotextiles are applied properly, with specific attention to covering the edges with six inches of soil. It goes without question that if the edges are "open" (not covered with soil), insects can enter and leave with ease. In addition, insects can maneuver easily under the tarpaulin/geotextile because of the head space available. Birds, specifically larger birds, like sea gulls, do sometimes "attack" a tarpaulin/geotextile, but significant damage is rare because the materials are tough.

Foams, especially non-hardening foams, are excellent barriers for insects, birds, rats, and dogs. If the coverage is thorough and complete, there are no "openings" for insects to pass through, and, in fact, if insects or flies contact non-hardening foams they will become attached and will subsequently expire from exhaustion, trying to free themselves.

It appears, from observations, that if birds cannot see or smell "something edible" they will not be interested and stay away. In general, birds "learn" that the non-hardening foams will not support them and they avoid contact. The same apparently applies to dogs.

In the case of the hardening foams, birds have learned that the foam will offer support, allowing them to land and peck at the surface, especially if the foam covering is thin and/or has cracked, exposing the trash - exactly contrary to the objective.

The disease vector issue will vary, since, quite obviously, the problem will depend upon the geographical location and the weather. Many of the Alternate Daily Cover Materials have had disease vector evaluations performed at one site or another. Additionally, state regulators will inform a prospective alternate Daily Cover Material user about specific issues relating to disease vector control.

**In conclusion, most of the Alternate Daily Cover Materials perform acceptably with respect to this criteria, as long as the materials are applied adequately and correctly. All vendors of Alternate Daily Cover Materials claim to control Disease Vectors.**

## ALTERNATE DAILY COVER MATERIALS AND SUBTITLE D

### Control of Fires -

This is an area for significant concern. Many of the currently used/offered Alternate Daily Cover Materials are flammable and therefore could not logically be expected to control fire. This portion of the rule has to be interpreted on the basis of soil as the standard - soil is not flammable! In fact, in states where potentially combustible material can be incorporated into daily cover - namely coal mining states, like Pennsylvania, for instance the amount of combustible coal residue allowed in daily cover soil is 12% or less.

Rusmar Incorporated has evaluated many Alternate Daily Cover Materials for flammability using the ASTM E1354 (2) testing procedure as suggested by Underwriters Laboratories, Inc., the group performing the evaluations. These data have been reported previously (3). Additionally, the publicly available literature has been reviewed yielding further information on the flammability of plastics and polymers used as Alternate Daily Cover Materials (4). The primary conclusions are:

(1) The ASTM E1354 Cone Calorimeter evaluation procedure has shown all the common tarpaulins/geotextiles to be flammable and therefore they should be considered unacceptable for daily cover.

(2) In order of increasing Time to Ignition, the results of the ASTM E1354 Cone Calorimeter evaluation are: Cormier RPVC, 24 seconds; Cardboard, 34 seconds; Sanicover, 42 seconds; Griffolyn, 43 seconds; Fabrisoil, 44 seconds; Typar, 52 seconds; Air Space Saver, 77 seconds; Plywood, 151 seconds; Plexiglass, 156 seconds; Red Oak, 266 seconds; and Dry Wall, infinite (non-combustible). These data are shown in Table I.

(3) The Heats of Combustion of the commonly used tarpaulins/geotextiles are equivalent to coal, coke, wood, and straw, and only slightly less than that of jet fuel, fuel oil, and gasoline. These data are shown in Table II.

(4) Organic materials, in general, are excellent fuels.

(5) Plastics are classified as ordinary combustibles.

(5) Hydrocarbons produce twice the heat per pound as do cellulose.

## ALTERNATE DAILY COVER MATERIALS AND SUBTITLE D

(6) Plastics are similar to most ordinary combustibles, such as wood, leather, wool, silk, etc. in that they are capable of thermal degradation into volatile and gaseous products of combustion.

(7) According to the NFPA (National Fire Protection Association), the lack of stability of plastics under high temperature conditions and inherent combustibility, have eliminated the use of plastics for applications where a fire resistance rating is a requirement (5).

**In conclusion, there are very few of the Alternate Daily Cover Materials satisfying the "control of fire" requirement. The non-hardening foams are non-flammable, simply because they are essentially all water. The other Alternate Daily Cover Materials, tarpaulins/geotextiles, claim to self-extinguishing or flame retardant, but, as mentioned above in item #7, these claims are not equivalent to non-flammable.**

<b>MATERIAL</b>	<b>IGN TIME (SECS)</b>
<b>CORMIER RPVC</b>	<b>24</b>
<b>CARDBOARD</b>	<b>34</b>
<b>SANICOVER</b>	<b>42</b>
<b>GRIFFOLYN</b>	<b>43</b>
<b>FABRISOIL</b>	<b>44</b>
<b>TYPAR</b>	<b>52</b>
<b>AIR SPACE SAVER</b>	<b>77</b>
<b>PLYWOOD</b>	<b>151</b>
<b>PLEXIGLASS</b>	<b>156</b>
<b>RED OAK</b>	<b>266</b>
<b>DRY WALL</b>	<b>INFINITE</b>

**ALTERNATE DAILY COVER MATERIALS AND SUBTITLE D**

**TABLE II**

**HEATS OF COMBUSTION OF REPRESENTATIVE MATERIALS**

**COMMON PLASTICS (3,4,5)**

Polyethylene	46.3 MJ/Kg
Polypropylene	46.4 MJ/Kg
Polystyrene	41.4 MJ/Kg
Polyvinyl Chloride	18.0 MJ/Kg
Urea Formaldehyde Foam	15.0 MJ/Kg
Unsaturated Polyester	26.0 MJ/Kg

**COMMON TARPULINS/GEOTEXTILES (3)**

Cormier RPVC	14.6 MJ/Kg
Griffolyn	28.7 MJ/Kg
Sanicover	31.3 MJ/Kg
Air Space Saver	32.0 MJ/Kg
Fabrisoil	32.5 MJ/Kg
Typar	33.7 MJ/Kg

**OTHER COMMON MATERIALS (3,4,5)**

Charcoal	34.2 MJ/Kg
Coal, Anthracite	32.8 MJ/Kg
Coal, Bituminous	30.5 MJ/Kg
Coke	29.5 MJ/Kg
Fuel Oil, #1	46.1 MJ/Kg
Gasoline	46.8 MJ/Kg
Jet Fuel, JP-4	46.6 MJ/Kg
Lignite	28.0 MJ/Kg
Paper, Newsprint	19.7 MJ/Kg
Straw	15.6 MJ/Kg
Wood, Dry, Average	20.0 MJ/Kg

## **ALTERNATE DAILY COVER MATERIALS AND SUBTITLE D**

### **Control of Odors -**

Most observers would conclude that if the daily working face is covered, regardless of the cover material, that odors would be controlled. This conclusion is definitely not supported by the facts.

There are two reasons: (1) the transport of "odors" through various barrier materials will depend on the composition, continuity, and thickness of the barrier; and, (2) those barriers (daily covers) that are removed subsequently will allow odorous materials, collected in the head space and/or on the underside of the barrier, to be vented to the atmosphere, essentially not delivering any net odor control.

Odor control performance can be quantified via the ASTM E679 procedure (6). In conjunction with the EPA Flux Chamber Technology (7), this ASTM technique can yield information on both odor control as well as total non-methane hydrocarbon control. It is important to recognize that some non-methane hydrocarbons do contribute to odors and that in the near future the EPA will likely be implementing controls on non-methane hydrocarbons (8).

These two testing procedures have been used to quantify odor and non-methane hydrocarbon control performance for Rusmar Incorporated Long Duration Foam, conventional soil cover, and three commonly used tarpaulins/geotextiles (3). These data are shown in Table III.

**In conclusion, all Alternate Daily Cover Materials claim to control odors, however, some vendors do not have evidence to support the claim.**

### **Control of Blowing Lifter -**

Blowing litter from the working face will be controlled by any Alternate Daily Cover Material capable of being "installed and maintained" under the worst case conditions being considered.

All liquid based materials - condensed phase and foams - can be applied in extremely windy conditions as long as the distance between the material discharge and the daily working face surface is small. Common experience will dictate that in high wind conditions, one wants to minimize the contact time between the "fluid" and the wind. Once on the daily working face the materials will be stable simply because the wind speed at the surface will be very low even if the official wind speed is 40 or 50 MPH.

**ALTERNATE DAILY COVER MATERIALS AND SUBTITLE D**

**TABLE III**

**ODOR AND HYDROCARBON EMISSION CONTROL  
FOR VARIOUS ALTERNATE DAILY COVER MATERIALS**

**SUMMARY OF RESULTS**

COVER MATERIAL	MEASUREMENT TIMING			
	IMMEDIATELY		NEXT DAY	
	ODOR NMHC PERCENT CONTROL		ODOR NMHC PERCENT CONTROL	
Rusmar Foam (6")	98	100	99	100
Soil (9")	99	93	99	93
Griffolyn	99	100	99	98
Air Space Saver	100	100	99	98
Fabrisoil	82	0	82	0

Tarpaulins/geotextiles will also control blowing trash effectively as long as they can be installed, controlled, and removed, in high wind conditions. No one would suggest that this goal could not be achieved, but under some circumstances placing a large surface area tarpaulin/geotextile could require considerable effort. Once on the surface of the working face with the edges correctly covered with soil and the mid-portions properly weighted, all the tarpaulins/geotextiles will perform acceptably.

**In conclusion, once installed, all the Alternate Daily Cover Materials will effectively control blowing lifter.**

**Control of Scavenging -**

All Alternate Daily Cover Materials will control scavenging simply by making the scavenging task difficult.

## **ALTERNATE DAILY COVER MATERIALS AND SUBTITLE D**

### **Summary - Alternate Daily Cover Materials versus the Subtitle D Rule -**

- (1) The Alternate Daily Cover Material must form a continuous barrier;**
- (2) The Alternate Daily Cover Material must be sealed on the edges when placed in use;**
- (3) Alternate Daily Cover Materials must be non-flammable (zero or negative heat of combustion) as defined by ASTM E1354 Cone Calorimeter test results;**
- (4) Alternate Daily Cover Materials need to control odors and this performance can be defined quantitatively via ASTM E679 test results;**
- (5) Post-use removal of an Alternate Daily Cover Materials can reverse any odor or non-methane hydrocarbon control benefit initially delivered; and,**
- (6) Control of blowing lifter and control of scavenging can be achieved with almost any suitable Alternate Daily Cover Material.**

### **STEP TWO - EVALUATE THE TOTAL APPLICATION COSTS -**

The limits of this evaluation have already been determined, even if an operator never thought about Alternate Daily Cover Materials.

At one end of the spectrum, the most inexpensive, and also non-compliant, is not using any daily cover at all. Under these conditions the operator saves all the daily cover air space without spending any capital or operating dollars. The risk side of this choice includes fines for violations under the current systems in place, and, additionally, under Subtitle D, a citizen suit which might interrupt the business, and will certainly include an expenditure for legal fees.

At the other end of the spectrum, is the current operating condition, using soil for daily cover. Without doubt, there are operators who receive qualified daily cover material for which they charge a tipping fee, and in these circumstances Alternate Daily Cover Materials may never compete. However, most operators either move soil from some other area of the landfill or purchase soil from an outside vendor, and have

## ALTERNATE DAILY COVER MATERIALS AND SUBTITLE D

it delivered. The really important question for daily cover soil users is, "What is the real cost of soil use?"

The real cost of daily cover soil is a combination of the current expense of placing soil in the landfill (moving, purchasing, hauling, stock-piling, and distributing) plus the air space consumption value, which is a function of the investment expense, therefore a function of the tipping fee, and the compaction factor or the in-place density of the trash.

If one uses, as an example, a one acre working face, the theoretical soil cover at six inches is 807 CY ( $= 43560 \text{ SF} \times 0.5 \text{ feet} / 27 \text{ CY/CF}$ ). If the in-place trash density, preferably without the daily cover being included, is 1200 pounds/CF, then that 807 CY of daily cover soil could be occupied by 484 tons of incoming trash. The operator can choose a suitable value to determine the revenue or profit corresponding to that many tons of trash, but assume for this example, one uses a tipping fee of \$50.00/ton, thereby defining the extra revenue available from the use of an Alternate Daily Cover Material as \$24,200.00. If that total revenue value is divided by the surface area, which we defined as an acre, 43, 560 SF, then the value of the air spaced saved by the use of an Alternate Daily Cover Material is \$0.56/SF, without considering the value of the soil itself, which might be between \$0.01/SF and \$0.05/SF, depending on the source.

This analysis has been generalized for varying tipping fees and in-place densities. The results are shown in Figure 1.

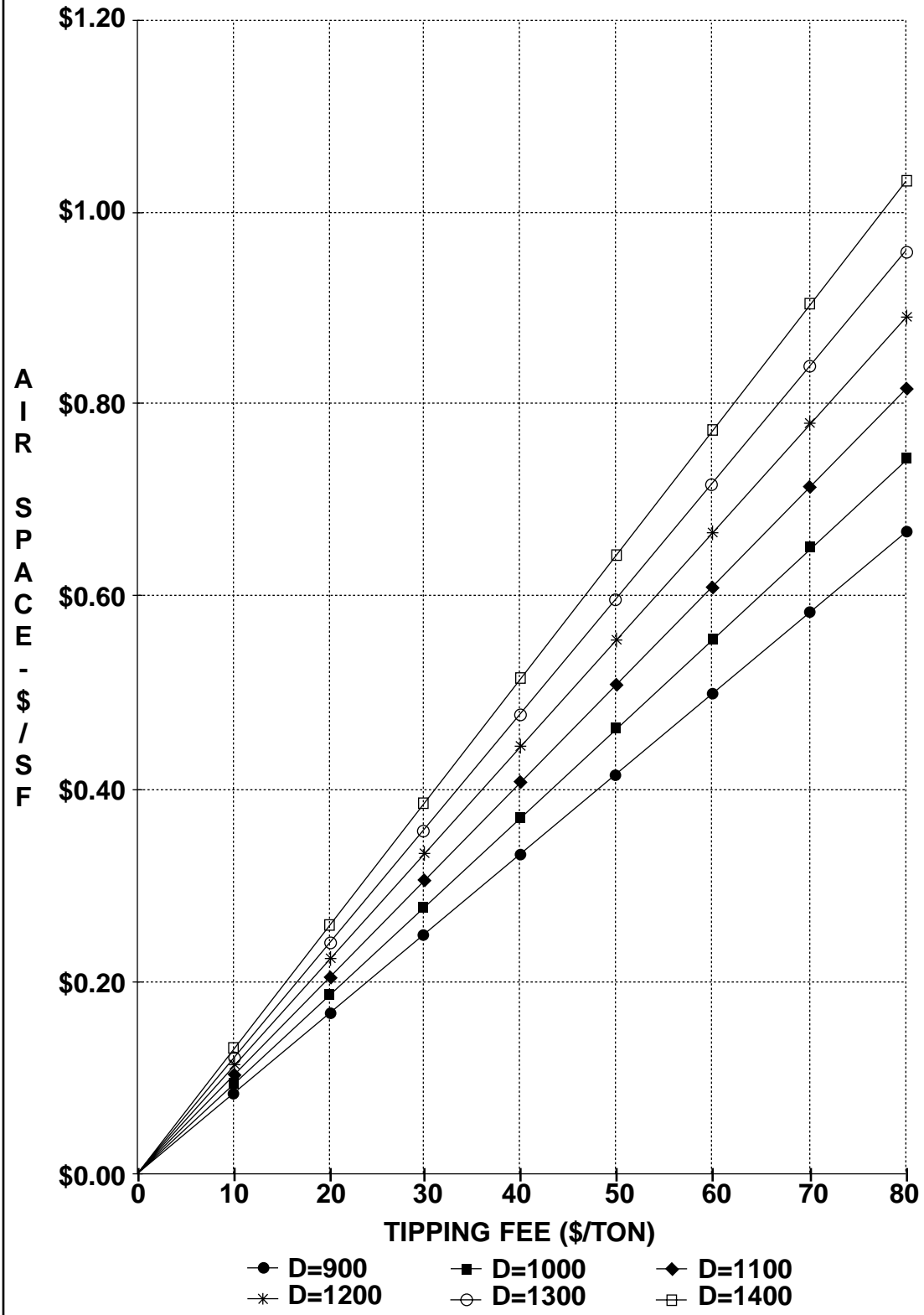
The benefit of using Alternate Daily Cover Materials will depend on the differences between the overall costs as compared to the overall savings. Normal landfill practices involve investing significant sums of money in the development of new landfills and the expansions of existing landfills. All of these activities spend current dollars in anticipation of future revenues and profits. The same evaluation procedures need to be applied to Alternate Daily Cover Material costs.

Starting at the inexpensive and non-compliant end of the cost spectrum there is no capital cost and no operating cost, because there is no daily cover use. Almost everyone will agree that is not an acceptable choice. Let's move up-scale slightly.

ALTERNATE DAILY COVER MATERIALS AND SUBTITLE D

FIG. 1 - DAILY COVER EVALUATION

AIR SPACE VALUE VS. TIPPING FEE



## ALTERNATE DAILY COVER MATERIALS AND SUBTITLE D

The variety of tarpaulins/geotextiles on the market all have no capital costs and operating costs probably in the \$0.01/SF, at the low end, to maybe \$0.04/SF, on the high end, depending on the initial cost per square foot and the number of times the tarpaulin/geotextile can be used.

It has already been determined that all of the currently available tarpaulins/geotextiles are flammable and that in some cases they do not satisfactorily perform other functions, like odor control, so they will not be acceptable under the Subtitle D rules. Therefore, the conditions may be better than the basic inexpensive, non-compliant case, but under Subtitle D, the non-compliance is still an issue. Let's move more up-scale.

This zone of operation, about \$0.05/SF to \$0.15/SF, includes most of the "liquid based" systems, both foams and condensed phase materials. In all these cases, some capital cost is involved, since equipment is required, and, of course, there is an operating cost.

The next important feature is the thickness of the daily cover, something that was not an issue with tarpaulins/geotextiles. There are several considerations with respect to thickness of daily cover: (1) Do the regulations in the state require a particular thickness? (2) Does the Alternate Daily Cover Material perform adequately at the suggested application thickness? (3) Are there public relations- issues involved with the decision - observations by the neighbors, or, perhaps, from a host inspector? (4) Are there optical appearance issues involved - does the daily working face really look covered, when the proposed material is applied?

Disregarding the regulatory thickness requirement which would over-rule the questions, the operator should start this part of the evaluation by simply thinking about how the landfill is operated. If the trash deposited during the day is well compacted and the working face is cleared of tires and other "difficult" objects, the thinnest section of daily cover yielding a reasonable optical coverage is about three to four inches. Think about it - the surface roughness, at the best, is about +2"/-2", compared to the average, so, if the Alternate Daily Cover Material is applied below that level, there will be many "flags" showing. Perhaps this level of performance is adequate, if you're never inspected. The general experience, around the country, is that, "If it looks covered, it is covered", and the corollary, "If it does not look covered, it is not covered".

## **ALTERNATE DAILY COVER MATERIALS AND SUBTITLE D**

If it is assumed that the operator wants the daily working face to "look covered", that establishes that about 4" of Alternate Daily Cover Material will be required. This conclusion will define that only foams will satisfy the requirement since the condensed (liquid) materials cannot logically be applied at that thickness and/or at that cost.

The analysis has now reduced itself to foam applications where the operating costs are in the \$0.05/SF to \$0.15/SF, depending upon thickness and type of material. In general, the capital cost for equipment for these systems will vary from a minimum of about \$50,000.00 for a handline system, to a maximum of \$300,000.00 for a self-propelled system. Disregarding, for the moment, the features and benefits of the various choices, the operator should, at this point decide approximately how many square feet of working face will be covered during the working life of the machine - maybe five or ten years - so that approximate capital cost per square foot can be determined.

One might choose about 180 foam days per year, as an average, and then multiply by the average size of the working face, 10,000 square feet, for instance. As a general rule-of-thumb, the proper size of equipment, for average size landfills, should be about \$0.005/SF to \$0.02/SF, calculated on the basis of all the square feet covered during the lifetime of the machine. More complex evaluations using the business depreciation schedule, landfill life, etc., could also be implemented.

**In conclusion, the application cost for a Subtitle D compliant Alternate Daily Cover Material will be in the range of \$0.05/SF to \$0.15/SF depending upon the choice of materials and the thickness of the application required. Foamed Alternate Daily Cover Materials are the only choices if the Subtitle D rules are operational and the landfill operator and/or regulator wants to have the daily working face "look covered". Equipment costs for foam systems will vary between \$0.005/SF and \$0.02/SF, depending upon style of equipment chosen, working life, and total number of square feet covered.**

### **STEP THREE - EVALUATE THE OPERATING CHARACTERISTICS -**

Not all foam systems are created equally - some are user friendly, some are not. First, evaluate the mechanical aspects of the system.

The landfill business is an outside business, and, in general, all the equipment used by a landfill stays outside all the time - summer and winter. Unless the operator is planning on constructing a building, the foam system and all its components must be winterized allowing them to remain

## **ALTERNATE DAILY COVER MATERIALS AND SUBTITLE D**

outside even in Canada. This includes the storage of the chemical concentrate, the foam machine itself, and the dilution water source.

**Rusmar Incorporated is the only supplier of winterized Alternate Daily Cover Material equipment. The Rusmar Incorporated winterization system is patented - US Patent #5,066,428, November 19, 1991.**

The landfill business is an equipment business, and, in general, most of the equipment used by a landfill is manufactured by recognized quality vendors.

**Rusmar Incorporated is the only supplier of Alternate Daily Cover Material equipment based on Caterpillar components.**

The landfill business is very regulated and in most places chemical drum disposal is forbidden. The use of an Alternate Daily Cover Material will consume too many pounds of product to allow the delivery of the product in drums. Disregarding the storage issues associated with drums, filling an Alternate Daily Cover Material foam machine from drums is a time consuming nuisance, and then the operator must decide how to dispose of the resulting drums. If the situation involves more than one component which is diluted with water the problem becomes even more complex. The better procedure is to receive the chemical concentrate in bulk deliveries, store it in winterized tankage, and meter and dilute it automatically into the foam machine.

**Rusmar Incorporated is the only supplier of Alternate Daily Cover Material equipment delivering chemical concentrate in bulk; storing the chemical concentrate outside in winterized equipment; metering and diluting the chemical concentrate automatically into the Alternate Daily Cover Material foam machine.**

The last landfill activity of the working day is the application of the daily working face cover. After that task is completed, often in the dark, the operators can park their equipment, lock the gate, and leave for home. It would be impossible to find a landfill operator who would want to finish his working day by cleaning the foam machine. Properly designed Alternate Daily Cover Material foam machines do not need to be cleaned.

**Rusmar Incorporated is the only supplier of Alternate Daily Cover Material equipment not needing any post-use clean-up.**

## **ALTERNATE DAILY COVER MATERIALS AND SUBTITLE D**

In many localities, the landfill operating rules require that the landfill activity cease by a certain time in the evening. When the operator has decided to use an Alternate Daily Cover Material foam, it is anticipated that less soil will be used and the foam machine will be operational and capable of finishing the task. The landfill workers do not want to start hauling soil one hour before closing. Equipment reliability is a very important characteristic of landfill Alternate Daily Cover Material systems.

**Rusmar Incorporated has more proven, reliable Alternate Daily Cover Material equipment in continuous use than any other supplier. Since 1990, when Rusmar Incorporated introduced the first self-propelled Pneumatic Foam Unit, Rusmar Incorporated has foam covered more than 25 million square feet of daily working face - no one else is even close. Our first customer has been using our technology since 1990, and they have covered more than 5.5 million square feet at their site alone.**

### **STEP FOUR - VENDOR EVALUATION: VERIFY CLAIMS & REFERENCES -**

The current interest in participating in the market for Alternate Daily Cover Materials has created a marketplace with exaggerated and unsupported cost and performance claims. The upcoming Subtitle D rules further aggravate the stabilization of the marketplace, so individuals considering Alternate Daily Cover Material technology must do some comparative evaluation of vendor's claims just to make certain the purchasing decision is justifiable. This is the same approach you would take for any other major purchase, except for the fact that this is a relatively new technology and the experience base is much smaller.

There are six performance features needing confirmation:

- (1) How many operating systems has the vendor sold, and how many are operating continuously?
- (2) Are the operating cost claims supportable?
- (3) Does the equipment perform as advertised, and is it reliable?
- (4) Does the vendor of the Alternate Daily Cover Material technology support his technology in the field - training and service?
- (5) How do the regulations in the operating state regard this technology - now, and after Subtitle D?

## **ALTERNATE DAILY COVER MATERIALS AND SUBTITLE D**

(6) Does the vendor assist in the permitting process, leaving the landfill operator free to perform his normal business activities?

Any vendor selling a technology should have a list of all of his previous and/or existing customers, and the vendor should be willing to share that list with a prospective new customer. Call some or all of them, particularly those in your state, where presumably the weather and the regulations are similar. Of particular interest, are those customers with the same size landfill where the equipment would be identical to that which you are considering.

If you are talking to an existing customer ask about the application cost, the reliability of the equipment, the ease of use of the equipment, the customer service from the vendor, the permitting process complications, if any, and the regulator's opinion of the technology.

If you are talking to an ex-customer, ask all the same questions, and find out why the customer is now an ex-customer. Everyone knows the complications involved in getting an Alternate Daily Cover Material integrated into a landfill operating permit, so an ex-customer must have some very good intelligence concerning his experience. Do not re-invent the wheel" - learn from other's experiences.

Sometimes the circumstances involve simple issues, like not being able to support the acquisition of the equipment, cash flow problems, sale of the landfill, too little life remaining, etc. Those items can be evaluated with respect to your own circumstances.

What you, as a prospective purchaser, needs to know is: Does the technology work? Is it "part of the problem" or "part of the solution"? Are the cost/performance claims valid? Am I buying a device that is a prototype? Will my purchase be supported by the vendor? Are spare parts and service available? What is the vendor's service track record?

When you have finished with this reference evaluation you will certainly understand whether or not the vendor's claims to you are valid and supportable. If they are not valid and supportable, your next action is clear. Why would you want to buy a technology that has never been used before, or worse, used before and found not to operate satisfactorily? Your job is to operate your landfill, not perform experiments.

## **ALTERNATE DAILY COVER MATERIALS AND SUBTITLE D**

If the references do prove to be valid and supportable then you are ready to proceed to the next step.

**Rusmar Incorporated can provide you with references satisfying all operational and performance claims. These include operating and capital cost, permitting issues, regulatory opinions, training, service, support, and guarantees.**

### **STEP FIVE - THE GUARANTEE -**

If the vendor has passed all the tests thus far, the last step is to have the vendor guarantee the performance of the technology in question. The guarantee should include the following items:

(1) The Alternate Daily Cover Material will satisfy the regulations currently, and post-Subtitle D regulations also. This guarantee requirement must include statements concerning control of disease vectors, control of fire, control of odors, control of blowing litter, and control of scavenging.

(2) The quoted operating cost will be achieved and this cost will be based upon the regulatory requirements issued by the state and included in the permit modification.

(3) The equipment will be unconditionally guaranteed during its first year of operation, including a Caterpillar guarantee for the drive components.

(4) During the subsequent years of use, the vendor will provide a nominal cost service agreement covering all aspects of equipment use except for maintaining normal fluid levels (fuel, lubricants, and hydraulic fluid), and non-operational damage.

(5) The vendor will provide the training required to teach your staff the techniques of proper Alternate Daily Cover Material operations.

(6) A thirty (30) day evaluation period during which all of the cost/performance and regulatory conditions will be demonstrated and confirmed.

**Rusmar Incorporated does provide a guarantee covering all these items. No other vendor of Alternate Daily Cover Material technology provides such a guarantee.**

## **ALTERNATE DAILY COVER MATERIALS AND SUBTITLE D**

### **RUSMAR INCORPORATED ALTERNATE DAILY COVER GUARANTEE**

The undersigned guarantees that the product named below will meet or exceed all local, state and federal requirements for Alternate Daily Cover Material. The undersigned further guarantees and recommends the use of the product named as Alternate Daily Cover Material, to meet the specific Alternate Daily Cover Material performance requirements of the Resource Conservation and Recovery Act, Sub-Title D, as implemented in the Code of Federal Regulations, CFR 40.

#### **CONTROL DISEASE VECTORS**

Disease vectors are animals or insects that help spread diseases. Common disease vectors include birds, rodents, flies, and mosquitos. The daily cover should control disease vectors by covering the waste that attracts them and by minimizing insect breeding areas at MSWLF's.

#### **CONTROL FIRES**

The daily cover should be non-flammable and should minimize potential fire hazards by limiting the movement of atmospheric oxygen into the waste and impeding the spread of fire in the landfill.

#### **CONTROL ODORS**

Decaying organic waste in MSWLF's produces foul odors that may escape to the atmosphere from the uncovered surface of the waste. The daily cover should control odors by preventing them from escaping to the atmosphere.

#### **CONTROL BLOWING LITTER**

Waste disposal of at MSWLF's includes paper, plastic sheets and rags that may be picked up and carried away by the wind. The daily cover should control blowing litter by keeping it in place and protecting it from the wind.

#### **CONTROL SCAVENGERS**

Scavenging animals, such as pigs, dogs, and birds, may be attracted to waste disposed of at MSWLF's. Scavenging animals seeking food and shelter at MSWLF's may be a nuisance or hazard to residents and activities in the general area of the landfill.

\_\_\_\_\_  
**Authorized Signature**

\_\_\_\_\_  
**Date**

\_\_\_\_\_  
**Product Name**

## **ALTERNATE DAILY COVER MATERIALS AND SUBTITLE D**

### **STEP SIX - ISSUE THE PURCHASE AGREEMENT -**

if the first five steps in this procedure have been completed to your satisfaction, then you have convinced yourself that the chosen Alternate Daily Cover Material technology:

- (1) Satisfies both the current and Subtitle D regulations;
- (2) Controls disease vectors, fires, odors, blowing litter, and scavenging;
- (3) Satisfies your application cost and air space savings requirements;
- (4) Exhibits operating characteristics that are compatible with your operations, weather, manpower, desires, and expectations;
- (5) Is supplied by a vendor whose performance claims are valid and supportable by multiple references who have been using the technology for many months through seasonal variations; and,
- (6) Is supplied by a vendor willing to guarantee his performance claims, allowing you an opportunity to proceed in an almost "risk free" mode.

There is no reason to hesitate any longer. You have done your homework, you know the questions and the answers, there is nothing remaining - **ISSUE THE PURCHASE AGREEMENT.**

## ALTERNATE DAILY COVER MATERIALS AND SUBTITLE D

### REFERENCES -

(1) Code of Federal Regulations, Protection of Environment, 40, Part 258, Criteria For Municipal Solid Waste Landfills, Revised as of July 1, 1992.

(2) ASTM E1354, "Standard Test Method for Heat and Visible Smoke Release Rates for Materials and Products Using an Oxygen Consumption Calorimeter", American Society for Testing and Materials, 1916 Race Street, Philadelphia, PA 19103.

(3) Kittle, Paul A., and Schmidt, C.E., "Comparison of Long Duration Foam, Synthetic Tarpaulins, Geotextiles, and Soil as Subtitle D Compliant Daily Cover Materials for Sanitary Landfills, presented at the Waste Tech '93 Conference, Marina Del Rey, CA, January, 1993.

(4) "Flammability of Plastics & Polymers Used as Alternate Daily Covers - A Summary of Technical Information from the Public Domain", Compiled and Edited by Paul A. Kittle, Rusmar Incorporated, April, 1993.

(5) Cohn, Bert M., "Plastics", in Fire Protection Handbook, Seventeenth Edition, National Fire Protection Association, Quincy, MA, 1991, pages 3-101 to 3-120.

(6) ASTM E679, "Standard Practice for Determination of Odor and Taste Thresholds By a Forced-Choice Ascending Concentration Series Method of Limits", American Society for Testing and Materials, 1916 Race Street, Philadelphia, PA 19103.

(7) "Measurement of Gaseous Emission Rates From Land Surfaces Using an Emission Isolation Flux Chamber, Users Guide", EPA Environmental Monitoring Systems Laboratory, Las Vegas, Nevada, EPA Contract No. 68-02-3889, Work Assignment No. 18, February, 1986.

(8) Doll, Dennis, EPA, OAQPS, Research Triangle Park, North Carolina 27711, is responsible for developing Total Non-methane Hydrocarbon emission rules for sanitary landfills.