DUST STOP MUNICIPAL BLEND + EARTHZYMME SOIL STABILIZER
Introduction
Dust Stop Municipal blend contains three main constituents; sugars, starches, and minerals. These components are all commonly found in nature and play a big role in our everyday lives. Sugar is the universal term for sweet, short-chain, soluble carbohydrates that are primarily composed of the elements carbon, hydrogen, and oxygen. Sugars can be derived from multiple sources; simple sugars are called monosaccharides and include glucose (also known as dextrose), fructose, and galactose. Granulated sugar which is most customarily used in the food industry is sucrose, also known as a disaccharide.

The building blocks of Sugar- Greatest binding influence in DSMB
Hydrogen bonding is the greatest contributing factor to sugar’s stickiness. When sugars are crystalline in structure they are unable to stick to other molecule but can be easily dispensed or poured. When a liquid such as water is added to crystalline sugar, the formerly strong oxygen-hydrogen bonds will begin to degrade and cause the newly available hydrogen atoms to seek out other materials to bind to. Available hydrogen atoms have an opportunity to stick to the closest surfaces, some will be attracted to the hydrogen molecules in the liquid, and some will bind with another available hydrogen or oxygen atom present in the sugar. This bonding action results in the sticky nature of sugar. When the bonds in sugar are broken there is more opportunity for the molecules to grab onto whatever they're in contact with, including other sugar molecules and surrounding particles. The new bonds are more secure because there are so many of them. Therefore, it’s harder to pull them apart.
Starches and Minerals
Starch is a term with the following meanings “strong, stiff, strengthens, stiffen”. Starches are comprised of polymeric carbohydrates consisting of a large number of glucose units joined by glycosidic bonds. They are insoluble in cold water and alcohol due to two types of molecules: the linear and helical amylose and the branched amylpectin. The minerals incorporated in DSMB are not unlike starches, due to their strong chemical makeup they are insoluble in water and have the opportunity to form bonds with other available molecules providing further strength and durability when applied. The bonds fashioned between the minerals, starches and sugars are, in most cases, stronger than the bond that would be formed between these components and water. Consequently, they are less likely to be dissolved or run off with the application of water.

How DSMB works
The unique blend of materials utilizes the functional properties of sugars, starches, and minerals allowing DSMB to bind and harden any loose particulate matter, decreasing dust on surfaces. DSMB is applied in a diluted form; water evaporates from the product as it dries. Dust control is achieved during this process as the high-viscosity, naturally adhesive material traps loose particulate.
1) Water is added to the highly concentrated product allowing for suspension of the active inputs; sugars, starches, and minerals.

2) As water evaporates, the molecules bind together to form a cohesive matrix.
3) The newly formed matrix will now function to attract and bind the loose soil, dust or other particulates that may otherwise become airborne and create dust.

Once applied to a surface, the available sugars, starches and minerals bind to the material encapsulating the particles, reducing the opportunity for them to become airborne.

Sugars, starches and Minerals

Dust and aggregate particles of a typical road

4) Over time; as more water evaporates, the solution becomes firm and durable preventing any of the encapsulated dust generating material from becoming airborne.

Once the DSMB has hardened, it completely surrounds and binds all dust, sands and gravel.
The product’s unique blend of materials also functions to reduce road surface issues in the rain or in wet conditions. The incorporated sugars compete for water making it less available to bind with other soil molecules while providing some minimal structural support and added road stability. The insoluble mineral component forms a bond with the sugar molecules creating some means of insolubility and will have less of a chance to run off in wet conditions. Once wet, the product will re-set once road surfaces dry, re-binding any loose materials. For these reasons, DSMB is not adversely affected by heavy rain, yet very effective and long lasting in dry weather, with no adverse effects on the environment or vehicles using the road due to its non-corrosive properties.
EarthZyme Road Construction
Dust Mitigation and Stabilization of Soil in Mining Roads

EarthZyme is a highly concentrated, 100% environmentally friendly liquid enzyme-based soil stabilizer specifically engineered for high clay content materials. The solution saves costs through the allowance for use of clay-based materials, which are typically marginal in terms of their engineering properties, and turns them into a high performance engineering input. EarthZyme treated materials require reduced long term maintenance requirements and allow for the use of cheaper materials when building roads, providing significant operational cost savings.

Canada

3) Kca Clay Grain Size
This chart shows the particle size analysis and hydrometer results of the Kca clay that is available for use in road building at the Syncrude Base Mine. This is offered as an example of the poor engineering properties that normally exist with these soils, and serves as a great example of the improvements EarthZyme has offered, considering the results of the DCP tests supplied.

Project details:
The first road built with EarthZyme for Syncrude was built in 2009 and is still in use today. All-roads at Syncrude Base Mine are subjected to variety of heavy haul truck traffic, the largest of which are CAT 797 (400 ton when empty) haul trucks To date approximately 350,000 cubic meters of soil have been stabilized.

DCP Evaluation of EarthZyme Treated Road

Prepared for: Syncrude Canada Ltd.
Prepared by: Cypher Environmental
1149 St. Matthews Avenue
Winnipeg, Manitoba R3G 0J8

June 8 – 9, 2010
Observations and Results

Some of the initial observations included: *EarthZyme Road:*

- Consistently flat with no potholes, ruts, or water accumulation
- Smooth running surface
- Minimal deflection from haul trucks

*Untreated road adjacent to EarthZyme section:*

- Undulated road surface
- Settled water in low spots
- Deflection was noticeable from haul trucks
- Cracking in road surface

*Gravel road (#702 & N. Mine Expressway):*

- Undulated road surface
- Considerable amount of road gravel was scraped into berm
- Road had extremely hard spots, but also very soft spots with loose material
- Cracking in road surface

Testing procedure

DCP testing was carried out at least four meters from the berm towards the center of the road and the interval between each test was approximately 10-20 meters. Proper procedure for using DCP instrument was carried out to ensure consistency. Conditions were dry for duration of test.

Summary of test results

Results show that the EarthZyme treated section is significantly more consistent in shear strength than the untreated road and gravel roads. The following charts highlight the results of the DCP testing. It can be seen that the average strength of the EarthZyme treated road is higher than the untreated road and the gravel roads. The range of values is substantially lower for the EarthZyme tests when compared with the untreated section and the gravel roads.

<table>
<thead>
<tr>
<th>Section</th>
<th>Average DPI (mm/blow)</th>
<th>Estimated CBR (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean</td>
<td>Max</td>
</tr>
<tr>
<td>EarthZyme treated section</td>
<td>2.49</td>
<td>2.93</td>
</tr>
<tr>
<td>Untreated adjacent section</td>
<td>3.00</td>
<td>4.87</td>
</tr>
<tr>
<td>Gravel Road (#702 &amp; N. Mine Expressway)</td>
<td>3.23</td>
<td>6.47</td>
</tr>
</tbody>
</table>
**Table 1: Comparison of test results**

**Consistency of test results**

In Figure 2 the results of each test are compared. It can be seen that the estimated CBR values of the EarthZyme road remains relatively consistent compared to the untreated conventional road and gravel roads. The range of estimated CBR values for each road can be seen in Table 1.

Figures 3 and 4 show the DPI and CBR values at their recorded depths. These charts show that the data is not skewed from variations in shear strength with increasing depth. The EarthZyme treated road shows a consistent, narrow range of values for increasing depth. The untreated conventional road and the gravel roads show a consistently high range of values for increasing depth.

**Limitations of test results**

The tests were usually limited to a depth of 200 mm, due to the difficulty of removing the instrument and time limitations. During testing it was seen that shear strength remained relatively constant with increasing depth (this can be seen from Figures 3 and 4). Therefore, it was decided that a wider sample of test data was preferred over deeper tests.

The correlation of DPI to CBR decreases in accuracy for DPI values less than 3mm/blow. The conservative Livneh relationship was used in order to avoid over estimation of CBR, but the CBR values could be higher based on other accepted relationships.

**Net Benefits & Savings to Mining Company**

*Xilinhot, China, by Shenhua Beidian Shengli Energy Co. Ltd.*

**17.4% REDUCTION IN FUEL CONSUMPTION**

Approximately 1 million gallons of fuel saved per year.

**$3.6 MILLION USD IN FUEL SAVINGS**

At an approximate rate of $3.60 USD per US gallon, approximately $3.6 million USD in fuel savings per year.

**LOWER ROAD MAINTENANCE COSTS**

EarthZyme® road exhibited substantial increases in engineering properties, requiring minimal maintenance.

**REDUCED VEHICLE MAINTENANCE**

Increased vehicle stability resulted in reduced tire wear and other maintenance costs.

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For more information, please contact an Aaims Logistics Representative

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