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SEMI-ANNUAL PROGRESS REPORT

**GRANULATED PEAT FOR
TARGETED INDUSTRIAL APPLICATIONS**

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Granulated Peat for Targeted Industrial Applications

Semi-Annual Progress and Financial Report for Minnesota Technology, Inc.

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Objective: To develop and commercialize an effective absorbent peat granule for use in removing metals and hydrocarbons from wastewater and as an industrial oil absorbent.

Background: This project focuses on the development of a peat granule for use in two targeted applications. The first application focuses on using the granules for removing dissolved metals and hydrocarbons from waste waters. The second application focuses on the development of a peat granule for use as a general purpose oil absorbent. The industrial cooperators in this study are TechniTran, a waste water treatment firm with headquarters in Minneapolis, Minnesota, Leoni International, a peat supplier located near Virginia, Minnesota, and Fisher-Stevens, an oil sorbent product distributor located in Victoria, Texas.

There are two distinct market segments in which peat granules can be utilized for cleaning up the environment. The first market is generally referred to by industry professionals as the oil spill maintenance market. In this market, sorbent materials are inventoried at strategic spill response sites. These facilities generally respond to larger spills which commonly occur around refineries, loading docks, ship yards and rail yards. It is estimated that this market in North America is \$100M and is forecasted to grow 30 percent over the next five years (Future Technology Surveys Inc., Survey on Sorbents, Report #168).

The introduction of loose peat to this market was launched in early 1989 by a number of Canadian companies. In late 1991, D M S & D Associates and Fisher-Stevens Inc., both sorbent distributors, teamed up with Mat, Inc., a Minnesota company to introduce the first US produced peat sorbent to this market. Sales of this sorbent have averaged nearly 500 tons per year since 1992. Sales are forecasted to grow 10 percent through 1995. The Natural Resources Research Institute (NRRI) was instrumental in the preliminary development and testing of peat sorbents for use in this market, and in helping Mat, Inc. develop its markets.

To achieve greater sales of peat in this market, distributors have indicated the products' dustiness must be reduced. Although dust has been addressed in the past by treating the peat with anti-dusting agents, distributors feel it must be reduced further. To address this need, NRRI has shown that granulating the peat to achieve specifically sized particles, significantly reduces air borne dust with only slight decreases in sorbency. When distributors were asked to judge the quality of sample granules, their response was this type of product would meet their needs.

The second market in which peat can be effectively utilized is in waste water treatment. Finnish, Canadian, and US research has shown that peat is an effective sorbent for a number of contaminants, including heavy metals, septic tank effluent, hydrocarbons, and landfill leachate.

Studies conducted by the NRRI in cooperation with TechniTran International identified the potential for using thermally processed loose peat for removing dissolved organics from wastewaters. The study concluded, that although peat was effective for sorbing dissolved organics, its application as a filtering media is limited because of severe swelling, low structural stability and bed compaction. Granulating the peat into a structurally stable particle would solve these short comings. The development of a peat granule which is not prone to compaction can expand the industrial applications in which peat can be utilized as a filtration media. The North American wastewater treatment market is estimated at \$10 Billion (Separation Dynamics Promotional Literature).

Summary of Progress: This report briefly reviews the progress that has been made in introducing granulated peat to the oil spill maintenance market and the wastewater treatment markets.

Oil Spill Maintenance Market

A process for granulating Sphagnum peat was developed. Two cubic feet of Sphagnum granules were produced using a lab-scale granulator. The granules produced by this method were evaluated for both sorbency and dustiness. Sphagnum peat granules are best suited to this market because of its sorbency and lighter weight.

The two most important performance factors associated with the use of loose peat in existing markets is sorbency and product dustiness. The most desirable consequence for granulating the peat would be to reduce dustiness without affecting sorbency. Results have shown that although granulation reduces dust significantly, a slight decrease in sorbency is also realized. Generally, a 20 percent decrease in sorbency was realized by reducing product dustiness nearly 200 percent. Many attempts were made to balance this trade-off by altering the method in which the granules were produced. However, it was decided the 20/200 percent trade-off of sorbency versus dust was acceptable. In addition, when product samples and test results were sent to distributors, they also agreed this was an acceptable trade-off.

Sales projections provided by D M S & D Associates and Fisher-Stevens have indicated that an additional 10 to 12 truckloads of granulated peat could be sold in their existing markets if an acceptable granulation method is developed.

Wastewater Treatment Market

The dry crush strength of granules produced at NRRI were measured on an Instron test machine. Results show that the crush strength of the reed-sedge granules produced with the NRRI granulator were affected by drying temperature.

The breakdown of the reed-sedge granules was assessed by measuring the fraction of granules remaining after washing with water in a column. Fractional breakdown averaged less than 1 percent after 1500 bed volumes of tap water were passed through a 2 in x 24 in column. This indicates that the granules are able to withstand high velocity water washings, an important factor for commercial application.

The cation exchange capacity (CEC) of the reed-sedge granules appears to be influenced by drying temperature but does not appear to be negatively affected by the process of granulation other than by temperature.

However, significant diffusion limitations were noted in sorption tests using the reed-sedge granules which is most likely caused by increased density of the produced granules or by the surface tension (hydrophobicity) of the granules. These effects can probably be reduced by producing a less dense particle and drying at lower temperatures. These options are currently being studied.

TechniTran International and Leoni International have proposed the formation of a start up company, Peat Technologies Corporation. The objective of this company is to pursue high-technology, high-valued uses of peat other than for horticultural or fuel uses. A business plan is being prepared by Roy Larson of TechniTran. NRRI continues to provide technical assistance and research services to this company.