

# Preliminary Evaluation of Separated Manure Solids Characteristics at the New ISU Dairy

## A.S. Leaflet R2318

Leo Timms, associate professor of animal science

### Summary and Implications

This summary provides preliminary data regarding dry matter content and environmental mastitis pathogen counts in separated manure solids at the new ISU Dairy. Animals were moved to the new dairy on Nov. 26-27, 2007 and manure solid separating was initiated on Nov. 29. Manure solids are separated using a Vincent KP-10 screw press separator. Manure solids dry matter content ranged from 27-39%. On days where DM% was 27-30%, issues with the separator and system led to enhanced liquid flow into the materials. DM % of 35-40% will be targeted for bedding solids. Total bacteria counts ranged from  $10^6$ - $10^8$ , with alpha streptococci ranging from  $10^5$ - $10^8$ . Total gram negatives ranged from  $<10^2$ - $10^7$  with coliforms ranging from  $<10^2$ - $10^4$ . Pooled samples are also being tested for presence of Salmonella and Mycobacterium paratuberculosis (Johne's). Refinement of the separation system and further characterization and standardization of manure solids will take place before use as freestall bedding material.

### Introduction

Bedding materials are used in most types of housing for dairy and other animals and are generally required to improve animal comfort and cleanliness, and assist in removal of moisture from the stall / housing environment. The choice of bedding materials by farms is related to the manure system used, availability and cost of materials, and personal preference with a desire to optimize or maximize the above requirements.

Technology to separate solid material from the liquid portion of cow manure and the use of this material as animal bedding has been known for > 30 years. Many dairies in the western US are dry lot dairies where the lots and resting areas are dried and managed manure solids (dried naturally due to limited precipitation and humidity, and raking or grooming). Most dairies in the rest of the US have never used manure solids or have abandoned them for dryer materials such as sawdust, etc. A major reason for these decisions and concerns relates to elevated incidence of environmental mastitis in some herds, as well as higher humidity and precipitation which hinder materials from drying appropriately. On the other hand, some research shows manure solids can be a suitable bedding if it is dried and managed properly.

There is a resurgence of interest in using manure solids that is growing from an increase in the installation of methane digesters, and regulations involving manure storage and application. Also the scarcity and high price of certain organic beddings (sawdust) has also increased interests.

The overall focus of this work will be to evaluate the characteristics of separated manure solids, starting from the raw product (manure) and following the material through its usage in stalls, including its overall impact on herd health performance, and economics, and provide insight into proper conditions and management techniques that are necessary to make this technology successful. The objective of this paper is to present preliminary data on characteristics (dry matter content/ environmental mastitis bacterial load) from the initial ISU Dairy separated manure solids.

### Materials and Methods

Manure is scraped into a central collection channel and transported via a manure auger (McLanahan, Inc.) into an outside collection pit. Manure is stirred and pumped (150 gpm) using a hydraulic piston pump (Houle Electromix) and solids are separated using a screw press separator (Vincent Kp-10) (Figure 1). Solids are collected on the floor beneath the separator in an enclosed building and transported either daily or every 2 days.

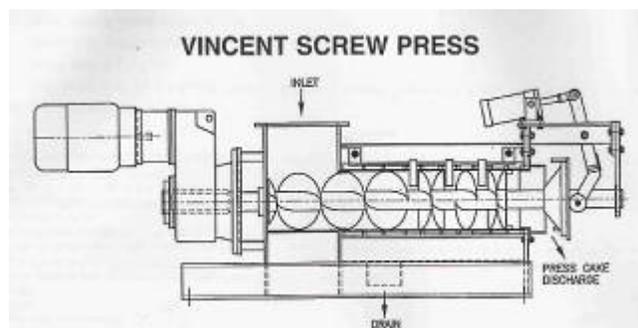


Figure 1. Vincent screw press manure solids separator.

#### Dry matter content:

25 grams of each sample was placed in 5 individual aluminum trays. Trays were placed in a drying oven for 24 hours, reweighed, and dry matter content was calculated.

#### Environmental mastitis organism counts

10 grams of sample material were added to 90 ml of phosphate buffered saline and mixed thoroughly. Samples were then serially diluted with 6 dilutions ( $10^{-2}$  -  $10^{-6}$ ) plated on MacConkey agar (total gram negatives and coliforms) and Trypticase soy blood agar (total bacteria and

alpha streptococci). Plates were read and colonies counted at 24 and 48 hours

**Results and Discussion**

Dry matter content of separated manure solids (Figure 2) ranged from 27-39%. Initial samples were 38-39% with a very consistent product. DM% has fluctuated and been lower since then (27-30% at some times) due to some issues with the system and times where excess liquid flow entered into and escaped through the separator. DM% is similar to other Iowa field trials where screw press separators are used. System adjustments and elimination of flow issues will target for 35-40% DM for use as bedding materials. Further increase of DM% to 65-80% (spring-fall) and 55-60 (winter) should be achieved when used in freestalls.

Log CFU bacteria counts / gram of separated solids material are shown in Figure 3. Total bacteria counts ranged from  $10^6$ - $10^8$  with alpha streptococci showing the highest bacterial numbers ( $10^5$ - $10^8$ ). Total gram negatives and coliforms ranged from  $<10^2$ - $10^7$  and  $<10^2$ - $10^4$ , respectively. Bacteria counts are similar compared to other Iowa field trials following anaerobic digestion and screw press separation of manure solids.

Pooled samples are also being tested for presence of Salmonella and Mycobacterium paratuberculosis (Johne's).

Refinement of the separation system and further characterization and standardization of manure solids will take place before use as a freestall bedding material.



Houle Electromix Piston Manure Pump



Vincent KP-10 Screw Press Manure Solids Separator



Separated Manure Solids



Vincent KP-10 Screw Press Manure Solids Separator

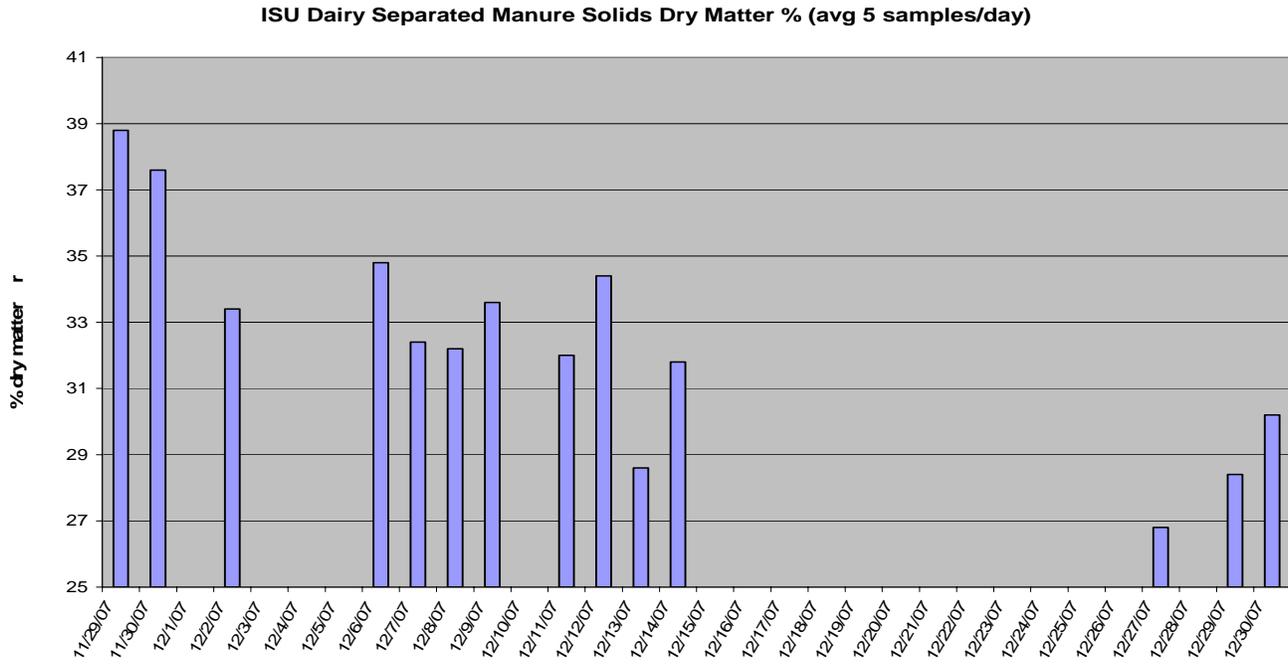


Figure 2. Dry matter content of separated manure solids averaged over 5 samples/ day.

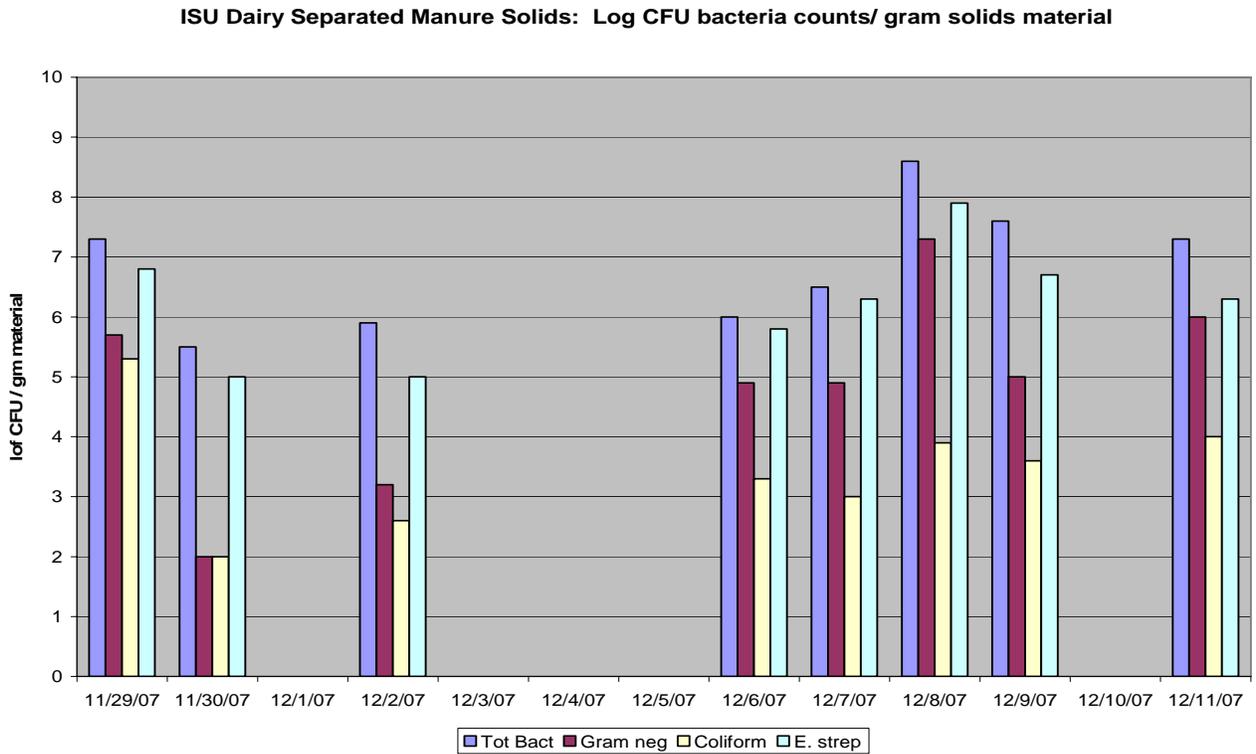


Figure 3. Log CFU bacteria counts / gram of separated manure solids material.