



AGRI-FACTS

Practical Information for Alberta's Agriculture Industry

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Compost Temperature Measurement: Livestock Manure

Composting livestock manure can address some of the problems and concerns related to intensive livestock operations while providing many other benefits to producers.

What is compost?

Composting is the biological decomposition and stabilization of organic material. The *Manure Composting Manual*, Agdex 400/27-1, produced by Alberta Agriculture, Food and Rural Development describes the process, methods, site selection, regulations and compost uses, so please refer to this document for detailed information (instructions for ordering this manual are at the end of this factsheet).

What should temperatures be?

The compost temperature increases due to the microbial activity, and the change is noticeable within a few hours of forming a windrow. The temperature usually increases rapidly to 50 to 60°C, and this is the level where the temperature is maintained for several weeks. This period is called the active composting stage. The temperature gradually drops to 40°C as the active composting slows down and the curing stage begins.

Composting essentially takes place within two temperature ranges: 10 to 40°C and higher than 40°C. Temperatures above 40°C are desirable because these higher levels destroy more pathogens, weed seeds and fly larvae in the manure. Composting temperatures of 45 to 65°C, when extended for more than a two-week period, are able to kill pathogens and destroy the viability of weed seeds.

What is temperature telling me?

Temperature is a very good indicator of the process occurring within the composting material (Table 1). Temperatures can exceed 65°C, but many micro-organisms begin to die, which stops the active composting stage.

Heat loss occurs primarily because of water evaporation from the pile. Allowing the moisture content to fall too low will increase the chance of reaching the damaging high temperatures.

During the active composting stage, the temperature should be monitored daily. A sustained drop in temperature indicates the end of the active composting stage. The failure of a cooled compost windrow to reheat after turning indicates that decomposition has slowed enough for the compost to be cured.

Table 1. Temperature indicates stage in composting process

Temperature	Indicates	Action
50 - 60°C	Active stage	Monitor temperature
> 60°C	<ol style="list-style-type: none"> Low to moderate moisture Microorganisms are working hard and generating damaging heat 	Add moisture and turn windrow Turn to accelerate heat loss
< 50°C	<ol style="list-style-type: none"> Insufficient oxygen/aeration High moisture content 	Turn to increase oxygen Add dry material
~ 40°C with no response from above actions	Material is entering the curing stage	Monitor temperature

How do I measure temperature?

It is important to measure the temperature as close to the centre of the composting material as possible. Typically, a thermometer with a 1 m long probe is sufficient to achieve this goal (Figure 1). The temperature can vary within the material, so it is important to measure the temperature in a variety of locations.

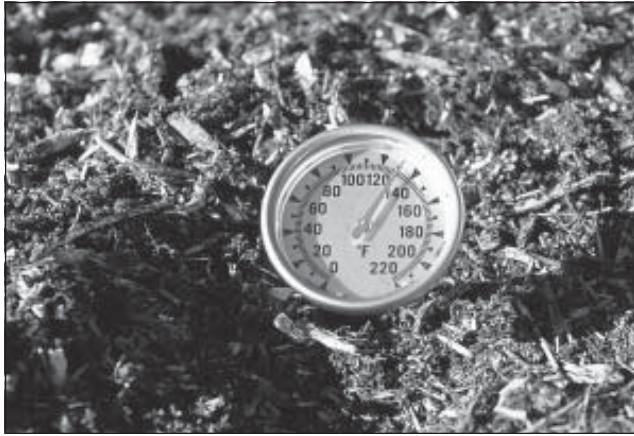


Figure 1. Probe to measure compost temperature (Fahrenheit).

Where can I find these and how much do they cost?

Buyers should research their needs and the products available before making a purchase. Providing possible supplier names and product descriptions below does not constitute an endorsement of any kind by Alberta Agriculture (Table 2).

To order a copy of the *Manure Composting Manual*, Agdex 400/27-1, contact:

Alberta Agriculture, Food and Rural Development
Publications Office
Telephone: toll-free 1-800-292-5697

For more information, contact:

Virginia Nelson, M.Sc., EIT
AgTech Centre, Lethbridge
Telephone: (403) 329-1212
Fax: (403) 328-5562
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Table 2. Probes for compost temperature monitoring

Supplier	Instrument	Probe Length	Readout	Approx. cost
Wika Instruments 3103 Parsons Road Edmonton, Alberta (780) 463-7035 www.wika.ca	Bimetal temperature probe	12 - 36 inches	3 inch dial	\$100 CDN
ReoTemp 10656 Roselle Street San Diego, CA 1-800-648-7737 www.reotemp.com	Bimetal temperature probe	24 - 72 inches	3 - 5 inch dial	\$100 - 250 US
	Handheld digital thermometer	Purchase separate		\$150 - 280 US
	Thermocouple probe	36 - 60 inches	Needs digital display	\$200 - 270 US
	Solar digital compost thermometer	24 - 72 inches		\$180 US
Omega Engineering Inc. 1 Omega Drive Stamford, CT 1-800-848-4286 www.omega.com	Stainless steel probe	12 - 72 inches	3 inch dial	\$100 - 200 US
CE Franklin 5305 - 64 Avenue Taber, Alberta 1-403-223-1111	Stainless steel probe	36 inches	5 inch dial	\$155 CDN