European focus

An International Look At Compost Standards

Methods used for evaluating compost quality in Europe are summarized in a new report.

William F. Brinton

THE CONCEPT of establishing standards specific to compost and the promotion of quality criteria to provide a strong foundation for development of the compost industry has been slowly emerging over nearly two decades throughout the western world. Recently, several European countries have adopted specific standards, and many other countries are in the process of doing so. This overview, based on a report prepared for the New York State Association of Recyclers by Woods End Research Laboratory, Inc., summarizes recent progress.

At a 1999 Vienna Conference, "Steps Towards a European Compost Directive," a status of national compost guidelines was presented. Following is a summary of what had occurred up to that time:

Austria — Fully established quality assurance system (there is a pass/fail on designated criteria for each category); Belgium — Established quality assurance system in Flanders. Brussels and other regions may follow Flanders example; Denmark — Recently implemented quality assurance system with standardized product definition, analysis methods; France — Limited quality criteria, research program underway for quality management; Greece — Basic solid waste rules, no official compost standard; Germany — Fully established quality assurance system, private association maintains standards; Hungary — New compost quality association; Italy — New decree in place for waste source separation, private compost association formed to evaluate standards; Luxembourg — Some compost plants follow German quality assurance system; Netherlands — Fully established quality assurance and certification system; Norway — Compost quality studies underway, criteria proposed for three quality classes; Spain — Compost guidelines established and proposal for quality certification system in Catalonia region; Sweden — Recently implemented standards and compost declaration system; Switzerland — Established minimum quality standards; United Kingdom — Proposed quality standards by private compost association.

Standards and Seal Programs

Several countries in Europe have some sort of compost grading system, either recommended, required by law, or an association-based quality seal program. Germany has had two types of quality seals that can be obtained for composts: the Bundesgütegemeinschaft Quality Seal and the Blue Angel seal. Both are authorized under the German Institute for Quality Certification and Declaration (RAL) — an agency that has a scope similar to "UL" in North America. The majority of composters seeking quality certification in Germany choose the RAL-BGK over the Blue Angel Seal (more than 200 composters certified under BGK versus 52 under the Blue Angel). The wider use of BGK is attributed to aggressive marketing of the seal that included several meetings and a newsletter for the composters.

The European Commission determined in 1992 that a seal of quality could be issued for any qualifying natural soil amendment produced within a member state. This is part of a wider

Table 1. Europe Eco-Label Standards Applicable to Composts

<table>
<thead>
<tr>
<th>Tested Traits</th>
<th>Limits As Determined By Test Methods 86/278/EEC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heavy metals</td>
<td>See Table 2</td>
</tr>
<tr>
<td>Special metals</td>
<td>Tint of physical appearance, absorbance at 750nm</td>
</tr>
<tr>
<td>Constituents</td>
<td>Organic Matter &gt; 20%, Moisture &lt; 73%, Total-N less than 2% TS</td>
</tr>
<tr>
<td>N-P2O5 + K2O</td>
<td>Application rates shall specify not more than:</td>
</tr>
<tr>
<td>application limits</td>
<td>17 g/m2 N - 6 g/m2 P2O5 - 12 g/m2 K2O</td>
</tr>
<tr>
<td>Pathogens</td>
<td>Salmonella non detect in 25g E. coli &lt; 1000 MPN/g</td>
</tr>
<tr>
<td>Other</td>
<td>Contains no offensive odors; No glass, wire or other fragments; No unacceptable weed seeds</td>
</tr>
<tr>
<td>Declarations</td>
<td>Must describe recommended use and application rates; All feedstocks &gt;10% must be reported; Nutrients, organic matter and metals must be reported; No phytotoxic effects</td>
</tr>
</tbody>
</table>

Table 2. Heavy Metals Limits (mg/kg) For European Countries With Compost Rules

<table>
<thead>
<tr>
<th>Element</th>
<th>A&lt;sup&gt;a&lt;/sup&gt;</th>
<th>B</th>
<th>Park</th>
<th>B</th>
<th>Ch&lt;sup&gt;b&lt;/sup&gt;</th>
<th>BK</th>
<th>Park</th>
<th>B</th>
<th>D</th>
<th>I</th>
<th>NL</th>
<th>NL</th>
<th>SP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arsenic</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>25</td>
<td>–</td>
<td>–</td>
<td>10</td>
<td>25</td>
<td>15</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>Boron</td>
<td>100</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>Cadmium</td>
<td>4</td>
<td>1</td>
<td>5</td>
<td>3</td>
<td>1.2</td>
<td>8</td>
<td>1.5</td>
<td>2</td>
<td>1</td>
<td>40</td>
<td>–</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>Chromium</td>
<td>150</td>
<td>70</td>
<td>150</td>
<td>200</td>
<td>150</td>
<td>–</td>
<td>100</td>
<td>200</td>
<td>70</td>
<td>750</td>
<td>–</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>Cobalt</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>Copper</td>
<td>400</td>
<td>100</td>
<td>500</td>
<td>150</td>
<td>150</td>
<td>–</td>
<td>100</td>
<td>300</td>
<td>90</td>
<td>1750</td>
<td>–</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>Lead</td>
<td>500</td>
<td>150</td>
<td>600</td>
<td>100</td>
<td>150</td>
<td>120</td>
<td>800</td>
<td>150</td>
<td>140</td>
<td>1200</td>
<td>–</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>Mercury</td>
<td>4</td>
<td>1</td>
<td>5</td>
<td>3</td>
<td>1.2</td>
<td>8</td>
<td>1.0</td>
<td>1.5</td>
<td>2</td>
<td>25</td>
<td>–</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>Nickel</td>
<td>100</td>
<td>60</td>
<td>50</td>
<td>100</td>
<td>50</td>
<td>45</td>
<td>200</td>
<td>50</td>
<td>50</td>
<td>400</td>
<td>–</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>Selenium</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>Zinc</td>
<td>1000</td>
<td>400</td>
<td>1500</td>
<td>500</td>
<td>500</td>
<td>–</td>
<td>400</td>
<td>900</td>
<td>280</td>
<td>4000</td>
<td>–</td>
<td>–</td>
<td>–</td>
</tr>
</tbody>
</table>

<sup>a</sup> Country Codes: A-Austria; B-Belgium; D-Denmark; F-France; D-Germany; I-Italy; NL-Netherlands; SP-Spain; CH-Switzerland
<sup>b</sup> Calculated on 30% Organic Matter basis
<sup>c</sup> NOTES: Class 2 as Versus Class 1 or Class A vs. AA; Agr=Agricultural use; Park=Horticultural use.

Program of issuing eco-labels within specific product groups. In 1998, the Directive was modified and upgraded with specific standards that apply to composts in general. The Eco-Label for composts (see Table 1) has not been widely used to date.

Of all potential quality standards, heavy metals have been the focus of most attention. Thus it is useful to explore the details of these standards country by country, beginning with an overview of the range of standards that are evident. The permissible metal ranges reveal significant variation within Europe. However, United States numbers diverge dramatically with regard to allowed Cd, Cr, Cu, Hg and Ni.

In some cases, different grades are distinguished, as in Austria which has three grades and Germany which has two sets of standards (see Table 2). Not all current metal standards are fixed; several countries, including Belgium, Italy and the Netherlands, have been exploring implementing still lower limits and several may adopt a two class system.

Among metal limits some countries expect to lower: zinc, nickel and mercury, based on current investigations. The metal limits may eventually be so low in some European countries that it may act as an absolute bar on composting for some types of wastes. Application of biowaste and other composts is controlled by existing soil metal levels. In Germany, according to the Waste Decree, compost application to land may require special permits based on soil metals for each soil type.

Other Parameters

For Compost Standards

The acceptable quantities of foreign matter in compost have been a subject of some debate, but generally there is greater agreement on these standards. Normally, stones are distinguished from non-decomposable "foreign matter" which includes glass, plastic and metal. The limits pertain to a percentage at a specific screen size. The following summarizes physical standards of countries that regulate compost. (see Table 3)

Sampling size and frequency have been examined by many countries. Both the quantity of a batch and the particle size or coarseness of the compost affect recommendations. For example, Germany recommends that for processing less than 2,000 tons/year (t/a), composting testing be done four times each year, over 12,000 t/a, it is 12 times/year. The Netherlands recommends one time each 5,000 tons, or a minimum of six times/year. In Austria, the figures are one time/year minimum or once each 2,000 cubic meters. France and Denmark specify once every six months, while Italy and Spain are unregulated.

Concerning temperature and time requirements for compost products as they relate to hygiene and pathogen reduction, Germany specifies more than 55°C for two weeks or more than 65°C for one week for open windrow systems. For closed/in-vessel composting systems, the requirement is more than 60°C for one week. In Austria, all composts are required to go through more than 60°C for six days, or more than 65°C for three days. In Denmark, the standard for all composts is more than 55°C for two weeks. Germany has extended the concept of hygiene in compost by distinguishing human/animal from plants or phytohygiene. In the latter category, all new compost facilities must demonstrate kill potential for tobacco mosaic virus (TMV) and club-root disease caused by Plasmodiophora brassicae. This is a procedure similar to PFRP equivalency in the United States.

There are few hygiene standards evident for worker safety at composting or organics recycling plants. However, a body of new evidence from international studies

Table 3. Maximum Foreign Matter Particles Allowed in Composts in Various National Standards

<table>
<thead>
<tr>
<th>Country</th>
<th>With Standard</th>
<th>Stones (% Of Dry Weight)</th>
<th>Man-Made Foreign Matter (Class, Plastic, Metal, % Of Dry Weight)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Austria</td>
<td>Must be &lt; 3% of &gt; 11 mm size</td>
<td>&lt; 2%</td>
<td>No visible contaminant, max. 0.5% &gt; 2 mm</td>
</tr>
<tr>
<td>Belgium</td>
<td>–</td>
<td>–</td>
<td>max. contamination 20%; &lt; 6% of &gt; 5 mm fraction</td>
</tr>
<tr>
<td>France</td>
<td>–</td>
<td>–</td>
<td>&lt; 0.5% for &gt;2 mm fraction</td>
</tr>
<tr>
<td>Germany</td>
<td>Must be &lt; 5% of &gt; 5 mm size</td>
<td>–</td>
<td>&lt; 3% total</td>
</tr>
<tr>
<td>Italy</td>
<td>–</td>
<td>–</td>
<td>&lt; 0.5% for &gt;2 mm fraction</td>
</tr>
<tr>
<td>Netherlands</td>
<td>Must be &lt; 3% of &lt; 5 mm size</td>
<td>–</td>
<td>“Free of contamination”</td>
</tr>
<tr>
<td>Spain</td>
<td>Must be &lt; 5% of &gt; 5 mm size</td>
<td>–</td>
<td>&lt; 0.5% for &gt;2 mm fraction; max. 0.1% plastic</td>
</tr>
<tr>
<td>Switzerland</td>
<td>&lt; 5% &gt; 2 mm</td>
<td>–</td>
<td>&lt; 1% &gt; 2 mm &lt; 0.5% if plastic</td>
</tr>
</tbody>
</table>

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suggests that a number of areas of concern exist for airborne contami-
nants within compost plants. These include allergic alveoli-
tis (EAA); Organic Toxic Dust Syndrome (OTDS); respiration al-
lergies from inhaled spores; dermal, pulmonary and systemic
infections; and contact allergies. It is rare to see a composting
plant in Europe that does not have negative air and vacuum air
hoods over bio-waste sorting conveyors.

Weed Content
At least three European countries have written or implied
weeds standards in compost: Holland, Germany and the Unit-
ed Kingdom. Holland has a limit of 2 weeds/liter. Germany
has a limit of one weed/2 liters and considers compost heavi-
ly contaminated when more than four weeds are found in two
liters. The United Kingdom limit is five weeds/liter. The Ger-
man test requires three liters of compost for the test; this can be
a cost and space constraint for many laboratories. (Woods End
has arbitrarily set a limit of less than five weeds/liter for agri-
cultural composts.)

Plant Phytotoxicity Tests
There are a variety of compost phytotoxicity tests which have
been proposed and published. Use of plants to indicate compost
maturity is seen as a protective approach, since respiration or
stability testing does not directly indicate potential plant prob-
lems. The various plant based tests rely either on a mixture of
compost with soil or peat (Germany) or 100 percent compost us-
ing garden cress, barley or radish seeds. In Switzerland, straight
(100 percent) compost is used and an additional test called the
“closed cress test” is applied; this distinguishes gaseous phyto-
toxicity in addition to compost-borne toxicity. Austria recom-
ends a test with a range of compost/peat dilutions.

Regarding plant growth performance standards, Germany
specifies 25 percent and 50 percent compost in standard soil me-
dia; barley or cress seeds must pass over 90 percent. Australia
lists up to 100 percent compost blend with peat; cress and bar-
ley seeds must pass more than 80 percent. Switzerland lists 100
percent compost in open and closed cress tests, with no
pass/fail levels.

Conformity Vs. Disagreement In Existing Standards
Compost quality assessment has gradually evolved differ-
ently in various parts of the world as political and industrial de-
v elopments have taken place. Surprisingly, there are a number
of areas which seem to be in close agreement across national
boundaries. Not surprising are the areas of difference.

One approach to choosing viable compost standards is take
the “path of least resistance.” Formulate a set of criteria which
reflect where general agreement is readily apparent, then iden-
tify areas where disagreement or weakness in approach is evi-
dent. Where moderate to significant steps are needed to reach a
general accord, it may be best to allow voluntary standards (and
discrepancies) to be used until further research indicates spec-
cific changes.

Will Britton is founder of Woods End Research Laboratory in Mount Ver-
on, Maine; www.woodsend.org. This excerpt is from his report: Compost
Quality Standards & Guidelines: An International View, which includes
data and comments comparing compost standards in the United States
with Europe, including variations in heavy metal standards. The full re-
port is available on the Woods End website.