TMECC

Test Methods for the Examination of Composting and Compost

Purpose

Test Methods for the Examination of Composting and Compost (TMECC) provides detailed protocols for the composting industry to verify the physical, chemical, and biological condition of composting feedstocks, material in process and compost products at the point of sale. Material testing is needed to verify compost product safety and market claims. TMECC provides protocols to sample, monitor, and analyze materials at all stages of the composting process, (e.g., prior to, during and after composting), to help maintain process control, verify product attributes, assure worker safety, and to avoid degradation of the environment in and around the composting facility.

Standardized methods to characterize compost are needed by compost producers, state regulatory and permitting agencies, compost product marketing specialists, state and commercial testing laboratories, and agriculturalists, horticulturalists, landscapers, and other consumer sectors. Use of standard methods and protocols for sampling, laboratory analysis, reporting, and interpretation of test results will promote production and marketing of quality composts that meet a core set of analytical standards.

TMECC is approved for publication through the USGPO as part of USDA's Conservation Resources Technical Bulletin Series.

Overview of TMECC Development

Summary

TMECC was jointly published by the US Department of Agriculture (USDA) and the Composting Council Research and Education Foundation (CCREF). The TMECC Project was initiated by The Procter and Gamble Company in mid 1995 under the direction of Phil B. Leege, and adopted by the Composting Council Research and Education Foundation in late 1995 under the leadership of Dr. Charles Cannon, former Executive Vice President of the Composting Council. Refer to Fig 1 through Fig 3 for diagrams that illustrate key participants and their responsibilities during the TMECC development and peer-review process.

TMECC evolution and the TMECC Project is categorized by six developmental stages: i) draft of methods; ii) compilation of methods; iii) content peer-review; iv) round-robin testing; v) addition of interpretation and end-use guidelines; and vi) maintenance and addenda distribution.

The initial draft of methods was completed in December 1995 and the enhanced compilation of methods was completed in December 1997. TMECC content peer-review was initiated in March

[1] The 2002 Compost Analysis Proficiency (CAP) Testing Program is managed by Robert O. Miller. CAP was established, in part, as a vehicle to measure performance, and to examine the credibility of TMECC. Visit http://tmecc.org/cap/ for detailed information.

1998 and formally completed in August 2001. Proficiency testing is underway and was implemented as follows: a preliminary round-robin using triplicate samples from 15 composting facilities and three laboratories was carried out in 2000 through collaboration with the USCC's Seal of Testing Assurance[2] (STA) program and USDA-ARS-BARC-SASL (Fig 4); in 2001 and 2002, round robin-testing was expanded to include 23 laboratories through collaboration between Compost Analysis Proficiency (CAP), STA and the TMECC Project (Fig 5).

Stage six of TMECC development will incorporate the proficiency testing program as part of a new and expanded peer-review process; data generated through proficiency testing will serve as a feedback mechanism used to update and maintain TMECC. CCREF is seeking formal relationships with professional organizations to fulfill the need for critical technical oversight of the peer-review process. Refer to Fig 6 and Fig 7 for diagrams that illustrate proposed feedback and TMECC maintenance mechanisms.

Stages I and II ▫ Compilation

The first stage of the TMECC Project which spanned approximately three years was principally funded by The Procter and Gamble Company and the MN Office of Environmental Assistance. This effort included bench-level evaluation of existing test methods at the U of MN Research Analytical Laboratory. Tests were performed on samples of source separated and mixed municipal solid waste composts. This effort involved modification of existing test methods developed for other materials, (e.g., soils, water, biosolids, etc.). A preliminary draft of TMECC was compiled using test methods employed at the U of MN and later expanded to include other generally accepted methods plus a small number of new techniques for analyzing compost parameters which had no generally accepted or readily available method. The product of the first stage of the TMECC Project was a 1,000-page peer-review draft entitled "The First Edition of TMECC".

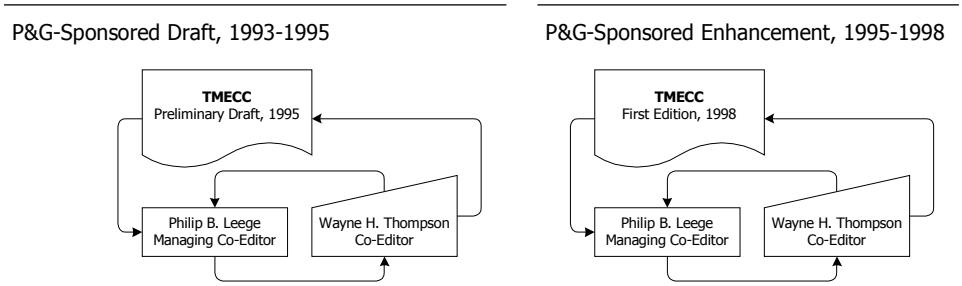

Fig 1. Stages I and II of the TMECC Project. The preliminary draft was compiled and later expanded to include additional methods. The final product of this effort was the peer-review draft, "First Edition of TMECC".

Stage III ▫ Peer-Review of the First Edition

The third stage of the TMECC Project was a coordinated peer-review of TMECC, the 1,000-page volume developed during stages one and two of the project (Fig 2). The peer-review process spanned a period of four years and was principally funded by the USDA.

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[2] The 2002 Seal of Testing Assurance (STA) is the USCC composting product data disclosure and end-use guideline program for compost producers and distributors. The program targets compost producers and is intended to promote the use of established compost sample collection and testing procedures, and to indicate appropriate end-use guidelines for their tested compost products. Visit http://tmecc.org/sta/ for detailed information.

TMECC sections were grouped into nine academic categories. A group leader was recruited to manage each review category. Each group leader recruited his/her team of peer-reviewers. The first edition of TMECC was then distributed to more than 175 reviewers selected for category-specific feedback. Individual reviewer input was compiled by each group leader and incorporated into TMECC by the Editor-in-Chief. The revised sections were then approved by the co-editors and re-submitted to the group leaders for their acceptance of the final draft of their assigned sections.

The peer-review process evolved into a rigorous re-write of TMECC. The latest USGPO working draft incorporates comprehensive critiques from over 175 compost analytical experts from around the world. This completely revised work was submitted to the USDA in December 2000 as a project deliverable; USDA extended the review process before granting its approval and acceptance of TMECC as a compost sampling and laboratory manual.

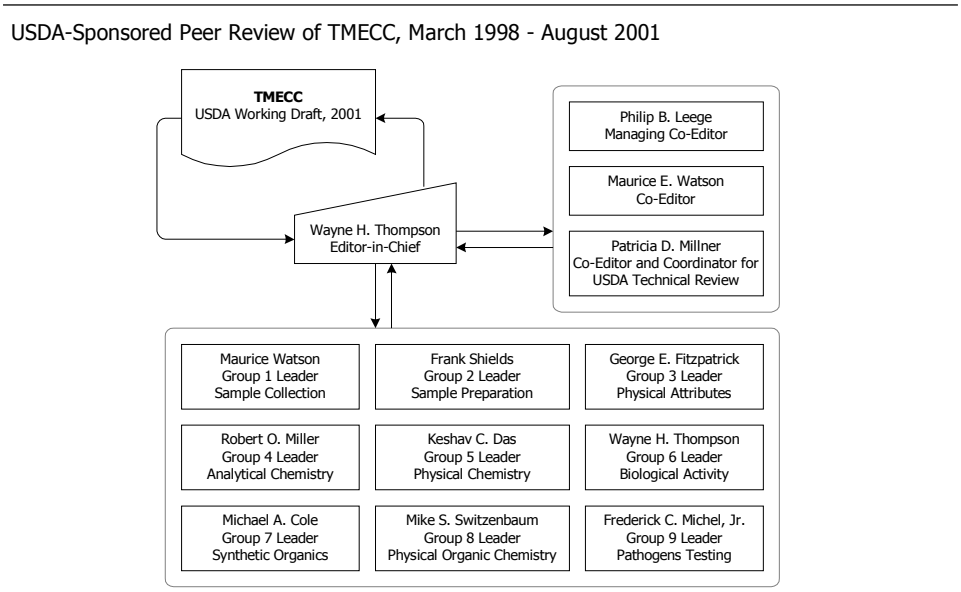

Fig 2. Stage III of the TMECC Project. The peer-review process was initiated in March 1998. USDA Technical Review was initiated in December 2000 and completed in August 2001.

Dr. Patricia Millner supervised the USDA internal review and worked directly with Editor-in-Chief of TMECC to implement all modifications required by USDA. Dr. Millner presented a prospectus to publish TMECC as a USDA Conservation Resources Technical Bulletin to the USGPO in October 2000; the prospectus to publish was approved in March 2001. The prospect of releasing TMECC as a USGPO document prompted USDA to intensify the review process which extended the Stage III completion date by an additional nine months. The USDA internal technical review was formally completed in August 2001 and the working draft was submitted to the USGPO editorial staff in August 2001. Refer to Fig 3, and Appendix I for the list of methods provided in TMECC.

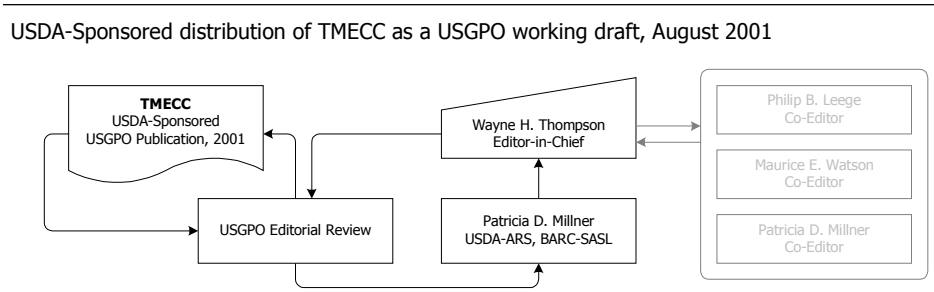

Fig 3. USGPO Review Process – The last step in Stage III of the TMECC Project.

Stage IV ▫ Laboratory Proficiency Testing

Laboratory proficiency testing is a QA/QC tool used by laboratory personnel to verify their analytical performance relative to other laboratories that use common methods and analytical protocols for specified parameters. The Compost Analysis Proficiency Testing program (CAP) was initiated through collaboration with managers of the North American Proficiency Testing Program (NAPT) to provide the compost laboratory analysis industry with an inter-laboratory QA/QC program, to develop reference materials, and to provide comparative data needed to measure performance and precision of TMECC analytical methods.

Laboratory proficiency testing is the fourth stage of the TMECC Project and is considered on-going. The USDA-Sponsored Seal of Testing Assurance Pilot (STA-2000) was implemented to serve as a preliminary round-robin designed to reveal operational oversights in common test methods. This was implemented prior to the formation of CAP and prior to the submission TMECC as a project deliverable to USDA. Refer to Fig 4 for the list of participants. Preliminary examination of the USDA-sponsored round robin results provided crucial information which allowed the TMECC editors to clarify important steps in various laboratory protocols with a resulting improvement in across-lab precision.

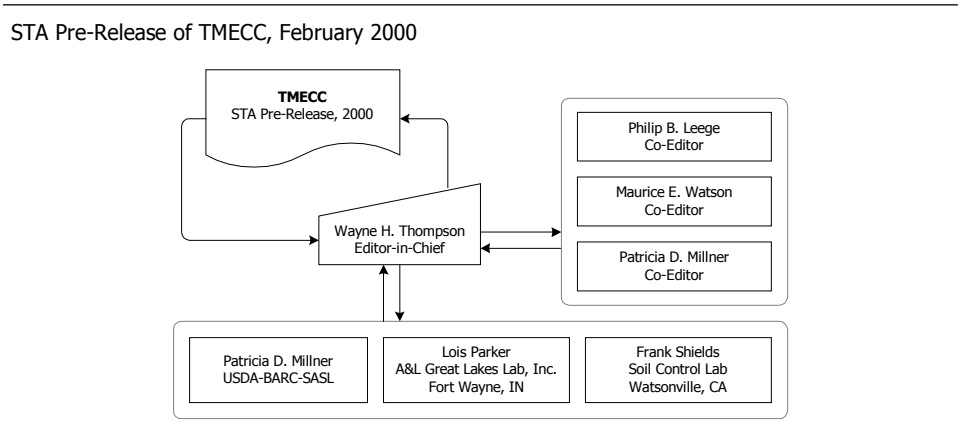

Fig 4. Stage IV of the TMECC Project. Preliminary round-robin testing was carried out by three laboratories on triplicate compost samples from fifteen facilities.

Round-robin testing of TMECC was expanded in 2001 and 2002 to include participating CAP laboratories (Fig 5). Preliminary results from the first 2001 sample exchange of the 2001 CAP program were not conclusive; results from later exchanges are needed to construct a more meaningful data set; and additional steps were implemented to incorporate more descriptive and detailed performance data reporting and comments from participating laboratory personnel. Participation in CAP is expected to increase after TMECC is released as a USGPO document.

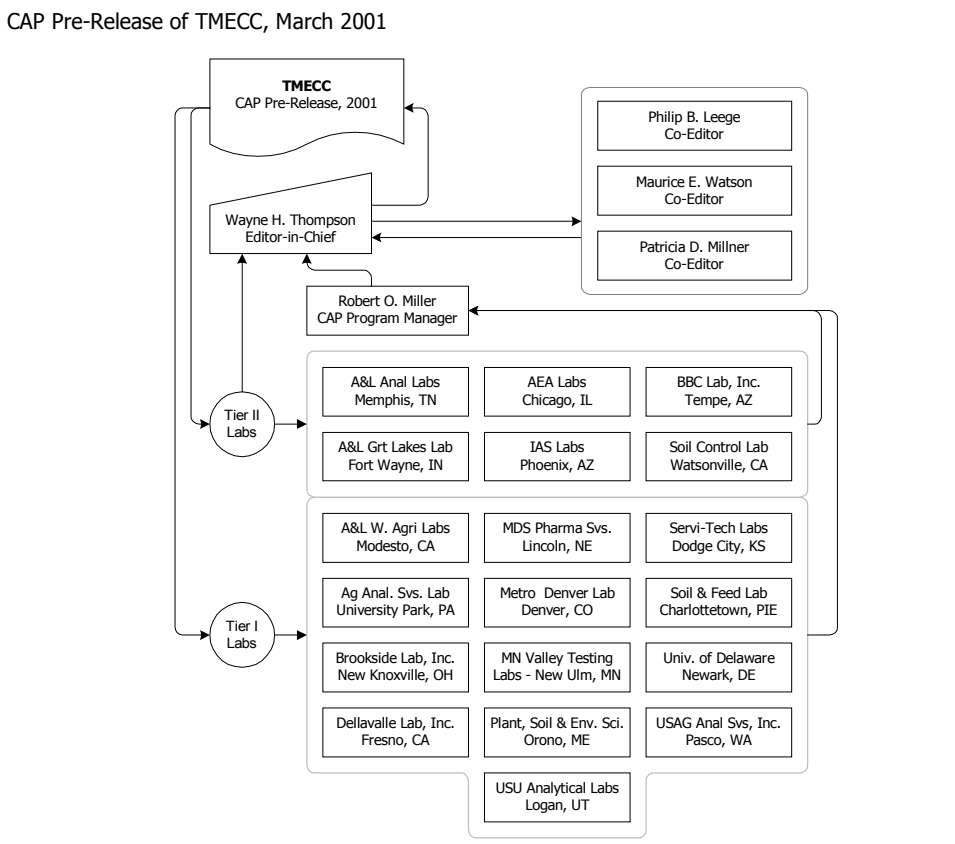

Fig 5. Stage IV of the TMECC Project. Round-robin testing through the CAP testing program.

Stage V ▫ Interpretation and End-Use Guidelines

The fifth stage of the TMECC Project is considered on-going. Interpretation guidelines were incorporated during Group 6 peer-review for two biological activity sections, the respirometry (05.08) and indicator ratios (05.02) sections. Much more effort must be expended and information compiled before this aspect of TMECC can be considered comprehensive.

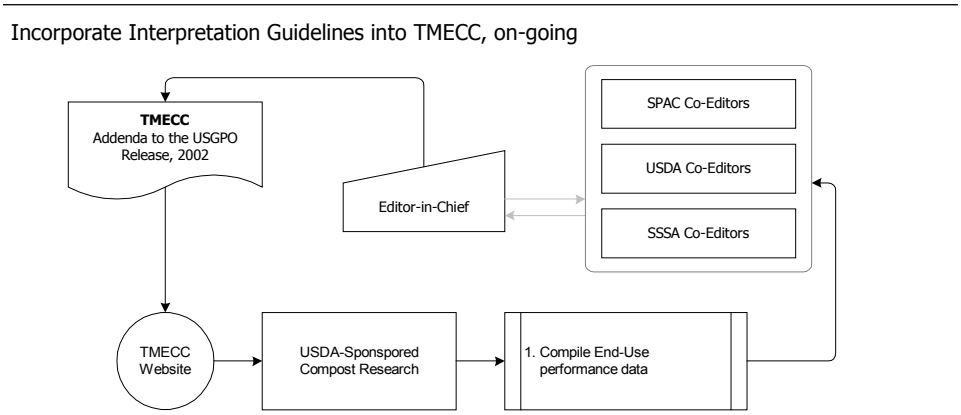

Fig 6. Stage V of the TMECC Project. Incorporation of interpretation guidelines.

Stage VI ▫ Maintenance and Updates, PROPOSED for 2002 and Later

The sixth stage of the TMECC Project will begin after TMECC is formally released through the USGPO as a USDA document. The Standards and Practices Committee of the US Composting Council is in the process of forming oversight subcommittees. Subcommittees will consist of compost analytical specialists who will provide technical oversight for the maintenance and enhancement of TMECC. The effort to form category-specific review subcommittees requires solicitation of technical assistance, paid and/or voluntary, from current participants of the TMECC review process and other qualified individuals associated with participating organizations, (e.g., Soil Science Society of America [SSSA], Soil and Plant Analysis Council [SPAC], etc.). The primary source of performance data and technical feedback will be collected through the CAP programs; secondary sources may include direct comment via feedback mechanisms available on-line at the TMECC web site, (e.g., discussion list, on-line manuscript submissions, etc.). Pending the availability of project funds, analysis of CAP results will be expanded to include site visits and a review process assembled to evaluate laboratory interpretation of TMECC methods. Finally, mechanisms to create TMECC addenda will be established to provide addenda to the compost analytical community (Fig 6 and Fig 7).

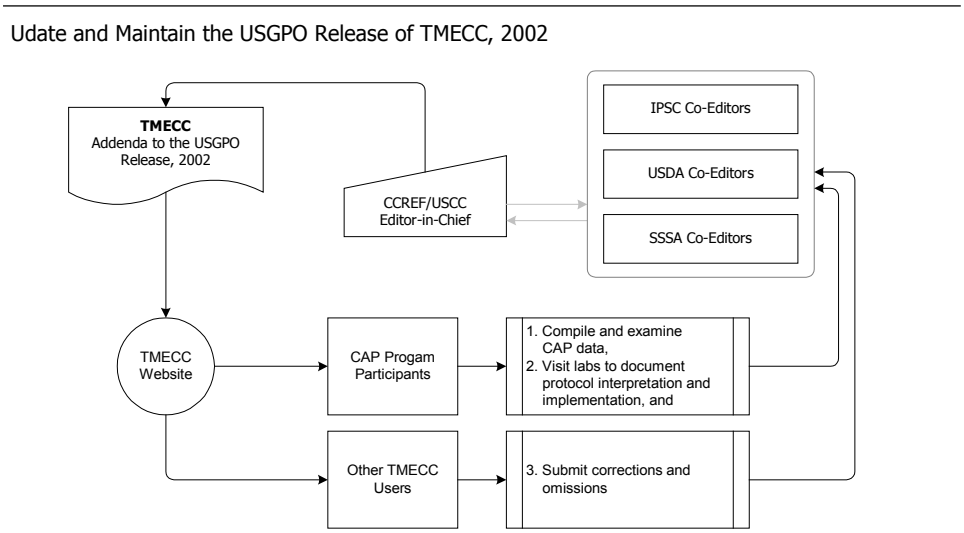

Fig 7. Stage VI of the TMECC Project (PROPOSED). Maintenance and updates of TMECC through feedback and review mechanisms.

Appendix I: TMECC Contents