

Peer Review Committee Summary

Life Cycle Assessment of Hand Drying Systems

Performed by MIT Materials Systems Laboratory for Dyson, Inc.

Members of the Peer Review Committee¹:

H Scott Matthews, Chair (Avenue C Advisors, LLC)
Jeff Morris (Sound Resource Management Group, Inc.)
Cynthia Manson (Industrial Economics, Inc.)

Background

The committee reviewed several versions of this study. The committee was delivered a draft study on May 10, 2011, an interim revision and a final report on September 10, 2011. This document summarizes the individual and collective comments of the peer review committee about the final report of this Life Cycle Assessment. Comments on previous versions were provided to the study authors, and many were addressed, that are not in this report. We did not review an executive summary of the study.

The structure of the committee report is such that we summarize our findings for particular aspects of the study. The report primarily focuses its review comments into the following categories, as detailed below.

- Is the methodology consistent with ISO 14040 through 14044?
- Are the objectives, scope, and boundaries of the study clearly identified?
- Are the assumptions used clearly identified and reasonable?
- Are the sources of data clearly identified and representative?
- Does the LCIA employ a sufficiently comprehensive set of category indicators?
- Is the comparison conducted category indicator by category indicator with no weighting of indicators?
- Are the category indicators scientifically/technically valid, environmentally relevant, and internationally accepted?
- Is there sufficient analysis of the sensitivity and uncertainty of the LCIA results?
- Is the report complete, consistent, and transparent?
- Are the conclusions appropriate based on the data and analysis?

Overview

The committee finds the submitted report to be of very high technical quality in all areas for a report that would be subsequently released to the public. The level of uncertainty analysis and modeling done

¹ Members of the committee were not engaged or contracted as official representatives of their organizations. Their comments should not be construed as official opinions of their organizations.

is rare for a study of this kind. The committee also acknowledges that identifying, collecting, and piecing together the available data for all of the hand drying systems is an exceptionally difficult task, as the prior reports and data sources span different companies, technologies, methods, and time scales. They also likely vary based on consumer preferences. Choosing which data sources and assumptions to use amongst all of these sources is also a difficult task due to the various stakeholders (e.g., towel or dryer manufacturers). The study task is a balancing act that needs to in the end try to satisfy all of these parties (a challenge itself beyond the actual study) yet still achieve a quantitative comparison that is fair. We feel that the study as a whole achieves this, yet highlight in the review below a few concerns pertaining to data choices and key assumptions.

This review should not be seen as an endorsement of the results of the study by any members of the peer review committee. Furthermore, this critical review has not as a rule verified or validated the goals chosen for the study, the collected data and used data sets, emission factors, calculations in developing the LCA results, or the ways in which the LCA results can be interpreted and used.

Methodology and Goal/Scope

- Is the methodology consistent with ISO 14040/14044?

The committee finds that the study is consistent with the ISO LCA standard. It adequately represents a cradle to grave comparative assessment of multiple hand drying systems.

- Are the objectives, scope, and boundaries of the study clearly identified?

The committee finds that these issues are all clearly identified.

Within this overall issue we have considered whether the goal and scope unambiguously state the following:

- Reasons for carrying out the study
- Intended application and audience of the study

These two bullet points are grouped together because the committee feels that these areas have been presented well in the study. It is to be used to support comparative assertions about hand drying systems. The audience is defined as any party interested in such results, and Dyson engineers.

- Whether the results will be used in comparative assertions intended to be disclosed to the public

The report explicitly notes the expectation that comparative assertions made to the public are intended, and it is written to support them.

The committee also assessed whether the goal and scope clearly describe:

- The function and system boundaries of the product systems to be compared

The report clearly in text and graphics shows the relevant systems studied.

- The functional unit and allocation procedures to be used

The functional unit is drying one set of hands. Allocations are very well detailed throughout the report. We note though that it is possible that use frequency for these dryers would not be directly comparable due to perceptions of hygiene (e.g., people may avoid cotton rolls or paper).

The allocation procedures are well documented.

- The data quality requirements

The data quality requirements are explicit, and the pedigree matrix approach is used to assess the quality of the data.

- The values choices, and limitations of the study

No value choices were made and thus no detail was needed. There are significant limitations to this study, which are sufficiently caveated and represented throughout the report and repeated in the report conclusions.

Study Assumptions, Results, and Conclusion

The committee assessed how the study has been conducted and reported, using the following categories.

- Are the assumptions used clearly identified and reasonable?

The committee overall finds that the report has been very well documented and that the majority of assumptions are reasonable and well supported. In some cases, available primary data has been replaced with prior data or assumptions from public hand drying studies to try to maintain consistency and use “industry data” when possible. This means that the data and assumptions used in this study may thus be based on assumptions important in the other studies and they may not have been as critically reviewed as this study. In some cases this has led to results that are counterintuitive yet supported by prior studies.

We specifically note a few of the assumptions made in the report that may cause questions on further review, and our overall sense of their effect on the results and implications.

Assumptions on Hand Drying

As noted above, the authors have used available data to support their research. Assessing the number of towels, or the amount of time, needed to dry hands is difficult. Dyson and the study authors relied on the NSF P335 protocol as a basis, which is a laboratory type test. The actual values an individual user may find (or those found by real world tests of large numbers of users) could be above or below the ranges used in the analysis. The committee did not attempt to independently verify either the number of towels or the amount of time needed to dry hands. The assumptions and data used in the study are justified and come from available sources, and have been assessed with uncertainty analysis methods, which on the whole we find credible.

Assumptions related to Virgin-Recycled Paper Production

The committee notes that the results from this phase of the life cycle model may be counterintuitive, and are different from other studies on the topic. We especially note the assumption that re-pulping recycled paper to manufacture paper towels requires the same kraft chemical pulping process as pulping newly harvested tree wood to manufacture paper towels, as well as about the assumption that carbon emissions from combustion of biogenic materials do not count as climate forcing greenhouse gas emissions. However the results arise because the study authors use assumptions and data from the well-known Kimberly Clark (KC) study on paper towels, which happens to differ from other studies from EPA, EDF, Franklin Associates, etc. (and we note that these studies further do not completely agree). While we would have expected the results to look different if they had built a model from other primary data, we can respect their attempt to satisfy industry stakeholders by using industry data. If one were to attempt to replicate this study with additional work, this could be an area to try to find common ground with towel manufacturers to update this data.

- Are the sources of data clearly identified and representative?

The committee finds that data sources have been very well and clearly identified. We already noted above several concerns about whether the data may be fully representative (e.g., drying times for various individuals) but the authors have caveated such issues in the report.

- Is the report complete, consistent, and transparent?

We find the report to be complete, consistent and transparent. It is a model of what should be included in a comprehensive LCA study.

- Are the conclusions appropriate based on the data and analysis?

The conclusions are generally appropriate, and based on the results done.

Indicator and Impact Assessment in the Study

- Does the LCIA employ a sufficiently comprehensive set of category indicators?

The report specifies which impact categories will be used, and gives justification of their use (and which are not presented) in the context of drying systems. The Impact2002+ method (via Simapro) was used for impact assessment.

- Is the comparison conducted category indicator by category indicator with no weighting of indicators?

The committee finds that the comparison is done by category indicator and without weighting, although 11 detailed categories are most often rolled up in the discussion and figures into just human health and ecosystem indicators.

- Are the category indicators scientifically/technically valid, environmentally relevant, and internationally accepted?

As noted above, the study uses the Impact2002+ method (via Simapro). The authors choose a subset of the Impact2002+ indicators.

While this method is developed and appropriate for use in Europe, the authors are applying it to scenarios in the US. However given the lack of a better US-focused LCIA method at the time of the study (and the carefully written caveats in the report noting this discrepancy) we find this choice of LCIA method to be appropriate. We note however that the IMPACT 2002+ characterization factors for human health and ecosystem impacts may be outdated given the recent release of USEtox.

- Is there sufficient analysis of the sensitivity and uncertainty of the LCIA results?

The sensitivity and uncertainty assessment frameworks used in this report are of very high quality. These parts of the report are very well done. If anything, they are so detailed and specific that they may be above the level of understanding for an average audience member. A shorter executive summary can help convey important points.