

Energy analysis of daily activities

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This paper makes a comparative energy analysis of alternative ways of performing certain activities of daily life. In particular, it compares the consumption of energy and the use of materials in activities such as communicating through an OHP (overhead projector) or copy paper for meetings, drying one's hands in different ways, communication by facsimile or mail, and electronic substitutes for conventional newspapers and books. The analysis reveals some key elements for building an energy-efficient society through a choice of life-style.

[Excerpt]

Fig. 1 shows the comparison between the energy consumption of an OHP and that of copy paper when the size of an audience is 1 and 10. It is clear that the OHP is more efficient if the size of the audience is more than 5. When using an OHP, we have to write bigger characters for the audience to read easily, hence it is sometimes difficult to put the same information on an OHP sheet as in a sheet of copy paper. When the amount of information expressed in an OHP sheet is less than that in a copy paper sheet, then the audience required for the OHP to be more efficient becomes larger. If two OHP sheets are used for the information in a sheet of copy paper, then more than 10 members in the audience are necessary.

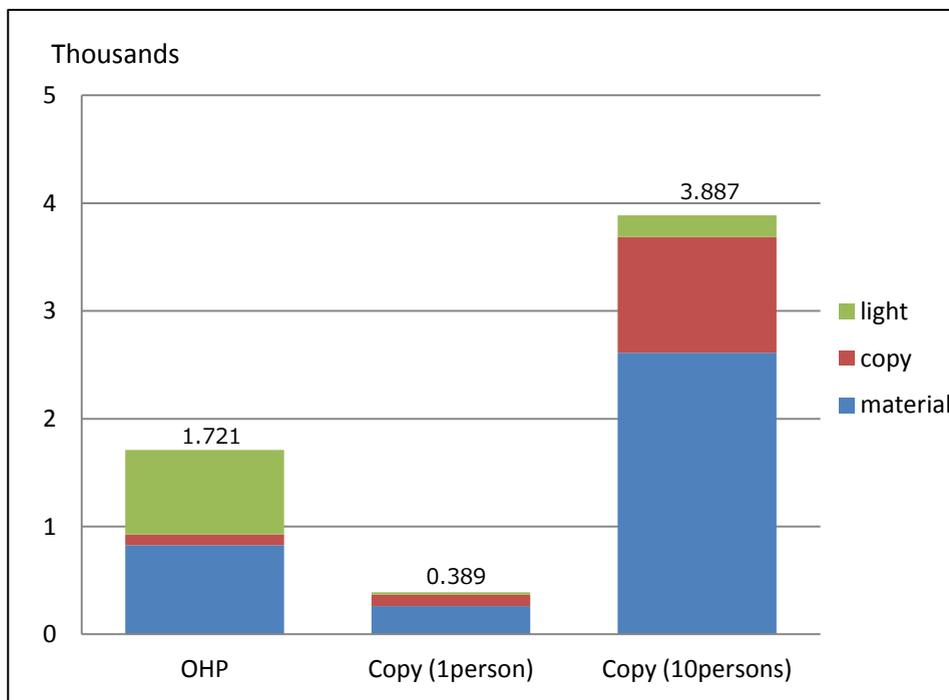


Fig 1. Energy demand of OHP and copy (kJ)

Fig. 2 shows the comparison of the three methods of drying hands under the above assumptions. It shows that a handkerchief is the most efficient method, the hand dryer is next, and the least efficient way is the use of two paper towels. If we compare not the energy but the cost, the result should be different. But, it is important to identify who pays the cost. Hand dryers and paper towels are included as equipment in public buildings, so the user usually does not pay the cost. Another problem is that the disposal of waste hand towels requires transportation which does not arise in the case of hand dryers. Strictly speaking, we should include these factors if possible when examining the problem.

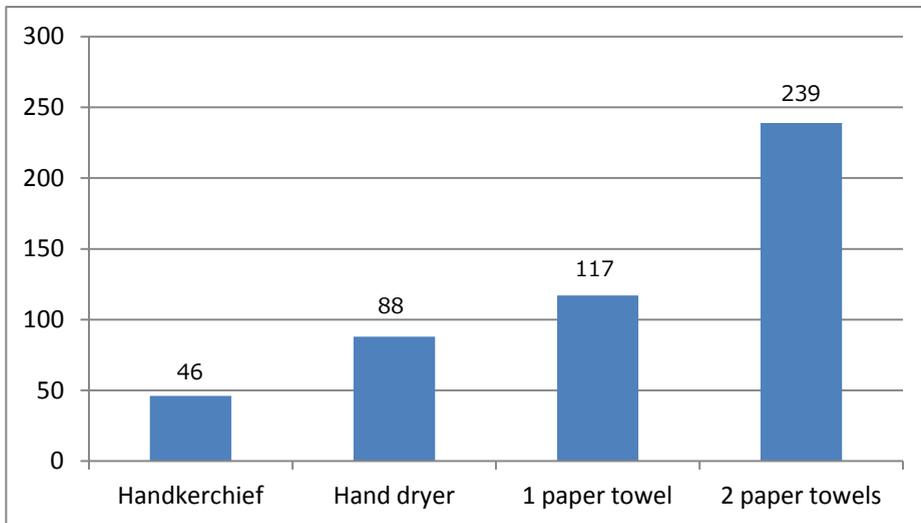


Fig 2. Energy demand of drying hands (kJ)

Fig. 3 shows the comparison between sending a sheet by mail and by facsimile. The energy consumption on facsimile mainly depends on the hours for which it is in the stand-by mode, that is, it depends on the frequency of use. If we send and receive 50 times a day by facsimile, then facsimile is 13 times more efficient, and if we use facsimile 5 times a day, then the facsimile is only twice more efficient than postal mail. In the case of sending many sheets of paper at a time, it is more advantageous to use mail. There are many other factors that we must take into account. When using facsimiles, we do not need envelopes but the recipient needs to pay for the consumption of thermosensitive paper. However, the analysis here shows that the energy consumption of a facsimile machine in the stand-by mode is not negligible. We expect future facsimile machines to have a lower energy consumption in the stand-by mode. Just as the refrigerator works 24 hours a day at home and accounts for the biggest share in household electricity consumption, machines which work all day long have very large energy demands.

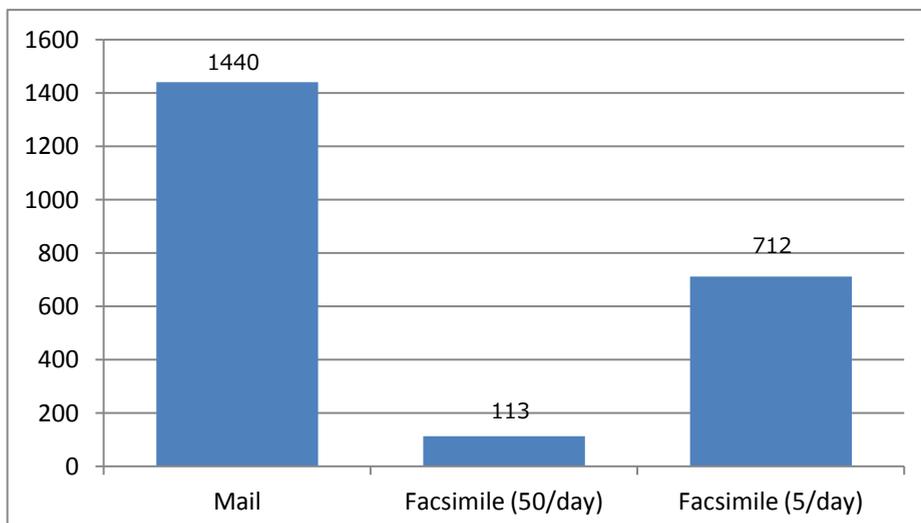


Fig 3. Energy demand of mail and facsimile (kJ)

Fig. 4 shows the energy demand of a book, a newspaper and the electronic display device used as an alternative to paper. The electronic display device is 20 times more efficient than a conventional newspaper and 40 times more efficient than a book. However, this conclusion does not take into account many problems that have not been analyzed here. The device has a small screen area and cannot be competitive with a newspaper which is easily readable at a glance. We do not fully know the environmental impact of battery use, and the influence of liquid crystal screen on the eyes. Of course, there are hopeful signs of further developments.

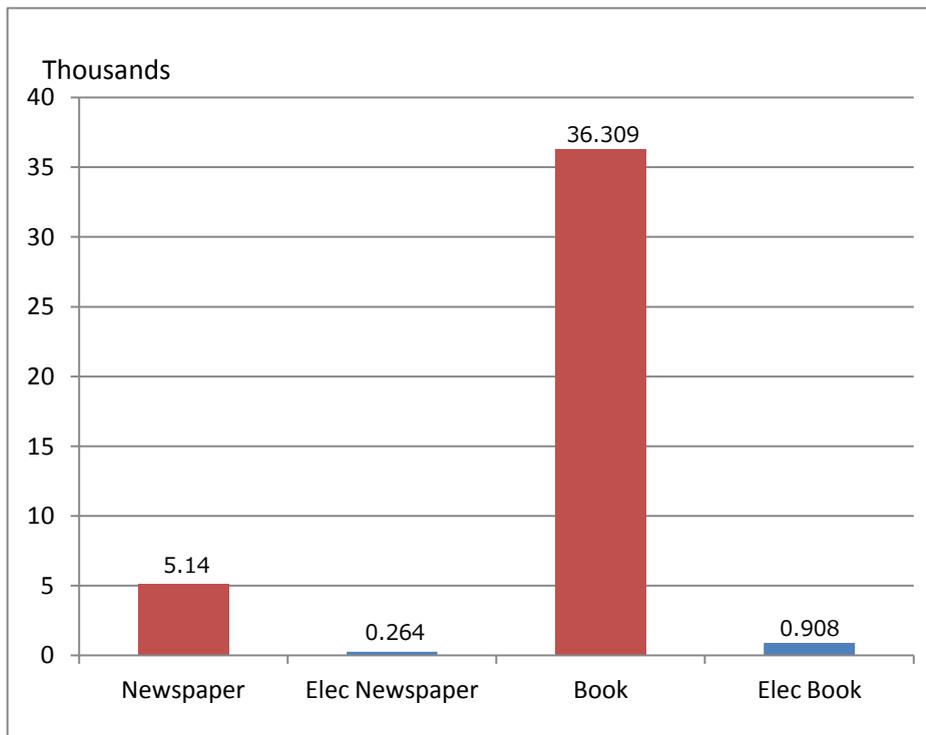


Fig 4. Energy demand of paper substitute (kJ)

Conclusion

The analysis presented above shows that there should be many interesting findings from the viewpoint of energy and resources if we want to be more careful in the use of energy and resources in everyday life.

The findings presented in this paper depend on the assumptions used and are not always applicable to different situations. However, one of the important points is that the electricity demand of information machines is greatly increased by their use in the stand-by mode use, and that the energy demand in telecommunication cannot be neglected. This suggests that industrial designers should develop new products with less energy consumption in the stand-by mode. And the suggestion to the users of material or machinery is that they should be careful and compare the alternative methods that are available when they do something involving the use of energy and resources.