

Getting Greener and Creating the Optimal: The State of Sustainability Research and the Preservation Environment

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I was recently standing in a store aisle dutifully debating the merits of various picture frames when one example of packaging caught my eye—a plain brown cardboard shell wrapped around a normal wooden picture frame. “Made From Renewable Wood!” was printed in green type on one side of the package, and my immediate thought was “wait a minute— isn’t all wood renewable if you manage it properly?” Was there something that made this wood special, or was this just an example of what has come to be labeled as “greenwashing”?

That question popped into my head when I sat down to think about sustainability research in this profession: are we doing something significant with our preservation environments, or are we doing the same thing that we’ve always done and just making it sound better? Worse yet, are we doing what we’ve always done and not bothering—or refusing—to adapt? Research currently being undertaken around the world has the potential to reshape how we evaluate and create the environment in which we preserve our collections. However, our own history and efforts can work against us if we continue as before—after all, we’ve fought for decades to achieve what was understood to be the “appropriate” preservation environment. Over the past several decades, constant, flat-line control of temperature and relative humidity; gas-phase filtration; and upgrades to ultra-modern mechanical systems were sought as best practices for the creation of preservation environments—often disregarding the amount of energy required to run these systems. Now, research is showing that, not only may flat-line conditions be unnecessary, but in certain common situations, they may be detrimental, and that mechanical systems may not need to run constantly to maintain appropriate environmental conditions.

Although a common initial step, the installation of newer, more energy-efficient equipment and systems is not a panacea. While the improvement in energy consumption is often undeniable, if resorted to as a sole solution, they often disguise key inefficiencies of the operation, as well as far more cost- and energy-effective solutions. While they can be part of the formula, the key to improving the sustainability of our preservation environments often lies elsewhere.

One way of finding the “better way to do it” is

to recognize what we want to attain: the **“optimal preservation environment” that achieves the best possible preservation of collections, at the least possible consumption of energy, and is sustainable over time.** That first step, achieving the best possible preservation of collections, requires an effort to define the best possible environment. For years, the standby of 70°F and 50% RH with minimal fluctuation was entrenched both in our minds and in the literature; the past fifteen years have been spent chipping at those edges. Thanks to Donald Sebera’s research on isoperms and the Image Permanence Institute’s (IPI) application of that research to create the Preservation Index and Time-Weighted Preservation Index metrics, we understand that cooler temperatures and lower relative humidity (RH) slow the rate of chemical decay of organic materials and we can quantify that rate. Moreover, concern for mechanical damage due to physical shape change cautions us to maintain moderate RH and avoid periods of extreme dryness or dampness. Marion Mecklenburg and David Ehrhardt have shown—presented most recently at the “2010 Rethinking Museum Climates” roundtable at the Museum of Fine Arts, Boston—that maintaining a tight RH band is unnecessary because many materials can experience elastic shape change in RH’s fluctuating between roughly 30–60% without suffering any permanent damage.

The conclusion we are left with, that most collections are best preserved at cool temperatures combined with moderate RH, is a far cry from the traditional 70°F, 50% RH flat-line condition, and gets us started toward a better way of thinking about environmental conditions in collecting institutions. Coincidentally, the same conditions play into the “least possible consumption of energy” aspect of an optimal preservation environment. In many climates these conditions are far more economical and sustainable to produce and, in turn, are the inspirations for much of the leading sustainability research in preservation today. In addition, research into the equilibration rates of collections materials informs us that most objects will fully equilibrate to a temperature change within 24 hours, while full equilibration to a change in RH may take up to 30 days or longer—allowing for creativity in designing sustainable solutions for preservation environments.

Already in use by a number of institutions, one simple method that takes into account both redefined conditions and our understanding of equilibration is the use of seasonal set points. In areas with discernable “hot” or “warm” versus “cool” or “cold” seasons, space

temperature set points can be “set back” during the cool season to avoid unnecessary heating of the space, simultaneously improving the preservation environment while saving energy. Seasonal RH set points (only humidifying to 30% in a dry season and only dehumidifying to 55% during a wet season) can be used to reduce the amount of energy spent on moisture control, rather than maintaining a steady 40–50% year round band in environments with seasons that cycle from dry to wet within relatively constant temperature ranges, or from cool and dry to warm and wet.

Currently, systems shutdown research conducted in the United Kingdom by The National Archives and systems shutdown and setback research carried out at IPI rely on this new understanding of an appropriate environment and the equilibration rates of materials. Both methods create short-term fluctuations in the preservation environment in order to achieve energy savings without adversely affecting the preservation of the collection. In cooler seasons, when outdoor temperatures are favorable, nighttime or weekend shutdowns, sometimes in addition to a seasonal set point change, can allow the outdoor environment to exert some influence on the space by dropping temperatures while saving energy. An eight-hour nightly shutdown could potentially save up to a third of the electrical energy used by a fan motor over the course of a season. Depending on the building envelope of the storage space in question, it is possible that shutdowns of varying length could be applied even during hot, humid months. A three-hour shutdown has the potential to save an eighth of the electrical energy used during a day. Better yet, investments in capital improvements may not be necessary. These methods and the use of seasonal set points can often be achieved with pre-existing mechanical systems. Whether contemplating a seasonal set point change, nightly shutdowns, or temperature setbacks, the key is to understand and work with the outdoor environment, and monitor the indoor environment to assess the effects of any operational changes.

Other research has re-examined the role of the mechanical system in the creation of the preservation environment. The Getty Conservation Institute has performed extensive research into alternate methods of managing and creating sustainable preservation environments in hot and humid climates, often concentrating on humidistatic control (the mechanical system reacts to RH levels in the space, as opposed to thermostatic, where it reacts to temperature) to prevent mold growth and mechanical decay. Cooling is only used to maintain conditions for human comfort rather than to control temperature for the preservation environment. By changing the method of control, the focus is on the more sustainable strategy of controlling moisture alone, rather than expending energy to control both moisture and temperature. Based on research and careful observation of existing structures and climate, The National Museum of Denmark has gone a step further, constructing purpose-built storage facilities that are largely passive in nature, with small-scale mechanical systems used primarily for summer dehumidification. Like the Getty example, these facilities are humidistatically controlled, taking advantage of an outdoor climate that is favorable to preservation, and using ground

temperature through the floor slab, little to no outside air exchange, and a well-insulated envelope to maintain moderate temperature and RH throughout the seasons. The primary energy consumption in this system comes from the occasional use of lighting (when the space is occupied), some air circulation, and a desiccant dehumidification unit to control occasional high moisture levels. Successfully applied in Europe, this model has potential for use in several regions of the United States, and is particularly applicable when exploring options for preservation environments for some large collections, where it can have significant impacts on reduction of energy consumption.

Sustainability in systems operation goes beyond how much and how often we heat, cool, humidify, or dehumidify. It takes energy to move air through systems; the more things that you put in the way of the air, the more energy will be required to push it through. Cooperative research is being conducted in Switzerland and the Netherlands to determine whether gas-phase filters installed in many cultural facilities to reduce the effect of pollutants on collections are necessary when comparing their effect on collections preservation to their initial and ongoing costs, or whether other mitigating strategies, such as housing or deacidification, can reduce the effects of pollution while potentially being more cost-effective.

It is not just the research that has moved forward; we are in the midst of a wave of global eco-consciousness and the profession and funding agencies are responding. Public monies funded many of the examples listed above, while private funders push the agenda by encouraging the practical application of these theories. In the United States, the Institute for Museum and Library Services (IMLS) and the National Endowment for the Humanities (NEH) have funded research and projects with sustainable collections preservation as the goal. The NEH’s Sustaining Cultural Heritage Collections program exists specifically to encourage applicants to plan for and implement new, sustainable strategies for collections preservation. Likewise, funding is being made available for continuing education resources to address these advances; IPI will be conducting a second series of free workshops and webinars on sustainable preservation practices for managing storage environments, thanks to funding from NEH’s Preservation and Access Education and Training Grant program. For more information on these workshops and webinars, see the project site at www.ipisustainability.org.

Opportunities for discussion of ideas continue, and new guidelines and strategies that incorporate some of these ideas are being disseminated through the literature. From the *Gray Areas to Green Areas* conference in Austin, Texas in 2007; to the National Archives and Records Administration’s 25th annual preservation conference entitled *Conservation2 = Preserving Collections x Our Environment* in 2011; to upcoming symposia concentrating on sustainability and preservation in both the United Kingdom and Germany later this year, more and more venues are available for us to gather and discuss every aspect of these challenges. The Canadian Conservation Institute’s *Environmental Guidelines for Museums*, released in 2010, includes some more energy-efficient operating

options, and the Dutch-language *Klimaatwerk: richtlijnen voor het museale binnenklimaat* (*Climate Work: Guidelines for the Museum Indoor Climate*), which leads users through a decision-making process to determine the necessary indoor climate for preservation (which can encourage energy-saving strategies), was published in 2009 with a forthcoming English translation.

None of these (or other examples that there is no room to mention) offers “the” singular solution, nor are these meant to provide formulaic answers. In creating an optimal preservation environment that is, by definition, “sustainable over time,” we must understand the requirements of our collections, the capabilities of our mechanical systems, and the options and possibilities for more efficient and effective preservation that exist—understanding that each situation, and the optimal solution, will be unique. Dictating our preservation environment needs to a facilities staff is no longer enough. We have to work and communicate to achieve our goals, recognizing that the ways we create an optimal preservation environment will also change with time. This is the significance of the research that has, is being, and hopefully will be done; through it we can move beyond creating preservation environments the same way that we always have, and move into a more self-conscious and sustainable strategy for the future.

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