The role of temperature on the loss of physical and optical properties of newsprint: An assessment of deacidification and subzero freezer storage for the long-term preservation of newspapers in their original form

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Introduction & Motivation

Traditional newspapers contain many of the elements we value in artifacts. Printed as history unrolls, they are primary sources and often the best witnesses we have to historical events. In addition to their inherent value as historical artifacts, much of what an original newspaper contains has not been—and in many cases still cannot be—retained in an analog or digital reformating. These features include the color and half-tone (see Fig. 1) of the images, the advertisements, and the feel and texture of the pages.

Fig. 1. August 29, 1963 issue of The New York Times downloaded from nytimes.com exhibiting poor halftone reproduction

With the advent of the Internet and the widespread adoption of all types of computers and mobile devices and the world wide distribution of news has rapidly shifted away from the traditional newspaper. The newspaper industry is in a state of precarious decline, the more than 500-year history of this decisively important form of communication is coming to an end, and the physical artifact that we know as an unbound, folded paper newspaper is vanishing. It is therefore integral that representative selections of newspapers in every country in the world be preserved in their original form.

This study uses accelerated aging of deacidified and unaged newspapers at multiple temperatures to determine the temperature dependence of newsprint aging and assess the efficacy of deacidification and sub-zero cold storage to preserve newspapers in their original form.

Materials & Methods

Materials acquisition

We determined there were two ways to obtain new-sprint for our study. We could (i) commission a pilot run of new-sprint formulated according to our specifications with all variables documented. Thereafter, we would have the paper printed on a web press with print quality controlled. Alternatively, we could (ii) obtain printed new-sprint that we determined constituted a “lot,” meaning every specimen was formulated and printed under similar conditions. We would then need to package and ship the in its original form. We opted for the latter approach, acquiring 175 copies of the March 31, 2014 issue of The New York Times. We further elected to use Section A, because the subsequent sections may have been from another lot of paper.

Aging and testing

The method we selected to analyze our paper for molecular weight was unsuccessful in getting the fibers to drop into solution. As lignin content increases, GPC becomes increasingly difficult, and newsprint (composed of grasses) is evidently on the frontier of current capabilities.

A research group active in this area was able to obtain molecular weight criteria for using a yet-unpublished method. We look forward to learning more.

Conclusions & Future Work

1. MIT Folding Endurance testing of our newsprint is only precise enough for, at best, qualitative comparisons between aging conditions.

2. Mechanical properties of our newsprint (unaged) are well within the range of “good” newsprint.

3. We will partner with, or closely follow, leading developers of this technology to incorporate GPC analysis into this study because of its rigor measuring chemical degradation.

4. The method we selected to analyze our paper for molecular weight was unsuccessful in getting the fibers to drop into solution. As lignin content increases, GPC becomes increasingly difficult, and newsprint (composed of grasses) is evidently on the frontier of current capabilities.

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Table 1. CIELAB (luminous D50, 2° standard observer, specular component included) aging properties of this paper while targeting key preservation criteria. We will partner with, or closely follow, leading developers of this technology to incorporate GPC analysis into this study because of its rigor measuring chemical degradation.

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