



**PaperSaver Deacidification Spray**  
**Mass per Page Information for Treatment of Acid Paper**

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## **PaperSaver Deacidification Spray Mass per Page Information for Treatment of Acid Paper**

### *Abstract*

PaperSaver was applied by aerosol spray to single to sheets of acid paper. Following uniform, replicate treatments and a brief period to allow the carrier to evaporate, sheets were weighed to determine deacidification solids add-on.

Measurements determined that the mass of the deacidification formulation added per page displayed a range of 0.3-0.5% of the total mass of each paper sheet.

The results of these tests provide a recommended application rate of 3 pages [single-sided applications] per ounce of PaperSaver formulation.

### *Introduction*

Alkaline oxides such as MgO have been used increasingly as agents for the deacidification of paper. Research by others has demonstrated that appropriate add-on levels of such materials to provide optimal treatment of acid paper substrates requires 0.36% of the total mass of the paper.<sup>1</sup>

Consistent with the use of alkaline oxide based formulations, conservators and archivists have found that with the aforementioned amounts of suitable alkaline oxide materials added to a given page, the lifetime of the acid papers can be significantly extended.<sup>2</sup>

In order to evaluate recently developed PaperSaver aerosol deacidification formulations for consistency of application for use by Conservators and Archivists, replicate treatments of acid paper sheets were conducted.

To assess loadings per sheet, the paper substrates were treated on one side only. The applications were made in this way for two reasons: (1) single sided application allowed for more consistent spraying of sheets and (2) strength testing of acid paper treated on one side versus two sides showed no significant difference.<sup>3</sup>

Interestingly, there has been discussion in the literature as to the utility of single versus double sided aerosol treatments for normal weight bond printing papers. Not surprisingly some studies<sup>2</sup> indicate that the deacidification of each side depends on the thickness and porosity of the paper,

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<sup>1</sup> Sarah D. Stauderman, Irene Brückle, Judith J. Bischoff. 1996. *Observations on the Use of Bookkeeper® Deacidification Spray for the Treatment of Individual Object*. The American Institute for Conservation.

<sup>2</sup> Buchanan, S., W. Bennett, M. Domach, S. Melnick, C. Tancin, P. Whitmore. 1994. *An Evaluation of the Bookkeeper Mass Deacidification Process: Technical Evaluation Team Report for the Preservation Directorate, Library of Congress*. Washington, D.C.: Preservation Directorate, Library of Congress.

<sup>3</sup> Zicherman, J. and J. White, 2005. PaperSaver TR 101 – Double Fold Testing of Treated Paper

recent research suggests that single-sided treatment may suffice given an appropriate conditioning period.<sup>1</sup>

### *Experimental*

PaperSaver materials used were contained in 8 fl. oz cans.

Treatments were applied by spraying 6-8 inches from paper held vertically for 3-4 seconds. Efforts were made to consistently spray each side equally over the entire surface of [one side of] the substrate. This resulted in an average of 28 sides being sprayed by each of the three cans used.

In order to determine amounts of treating formulations applied to each page, untreated paper was weighed before treatment. After being treated each sheet was allowed to condition for 5 minutes. The 5-minute period was determined by noting the time for sheets to come to constant weight using a balance after treatment.

During that 5-minute conditioning period, the hydrocarbon solvent was fully evaporated to ensure that the gain in mass measured is solely based on the deacidification treating solids. The paper was then massed and the increase contributed by the treating solids was recorded.

### *Results*

The exercise to determine overall yield for the 8-oz. container sizes evaluated determined that each can of PaperSaver deacidification spray treated between 25 and 30 pages. See Table 1 for testing information. This provides a reliable estimate of how many pages an archivist or conservator can treat *from that size container. Other sized containers of PaperSaver will treat proportionally greater of lesser numbers of sheets.*

A more detailed exploration of the mass-per-page of treating formulation transferred was performed by consistently treating 10 sheet sets of pages. In this case, the dry mass of PaperSaver treating formulation added per page ranged from 0.3% to 0.5%. These values are well within the amount of material needed to efficiently affect the lifetime of the acid substrate.

Table 2 below details the relevant data and statistics for the detailed mass-per-page experiment.

*Observations:* Consistency in spray procedure proves to be the key in producing spray efficiency and reproducibility. Shaking of cans between every few pages treated and even spraying across sheets insures better coverage and ultimately better treatment of the paper sheets.

*Caution:* As noted in PaperSaver instructions, the carrier used while non-toxic is a hydrocarbon and should be used in a well ventilated space free from open flames or sparks.

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**Table 1.**

PaperSaver Bottle Number	Pages Treated
1	30
2	25
3	29
<b>Average</b>	<b>28</b>

**Table 1-** Shows the number of sheets of paper treated for three 8 fl. oz.-cans of PaperSaver with consistent spraying.

**Table 2.<sup>4</sup>**

Trial	Initial Mass of Paper	Final Mass of Paper	Difference	%
1	0.781	0.784	0.003	0.2352
2	0.762	0.767	0.005	0.3835
3	0.795	0.799	0.004	0.3196
4	0.777	0.785	0.008	0.628
5	0.754	0.761	0.007	0.5327
6	0.721	0.727	0.006	0.4362
7	0.745	0.749	0.004	0.2996
8	0.792	0.797	0.005	0.3985
9	0.79	0.795	0.005	0.3975
10	0.755	0.760	0.005	0.38
<b>Average Mass %</b>		0.4		
<b>Standard Deviation</b>		0.1		

**Table 2-** Mass data for add-on with to untreated sheets of acid paper. Statistics indicate the mean mass percentage and the standard deviation.

*Conclusions:*

The PaperSaver spray treated approximately 3 sheets per treatment ounce with necessary add-on being achieved during consistent application.

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All Experiments Performed using Crane's Crest 90 GSM Wt. 24 Fluorescent white wove paper