



Independent of technology and generating curiosity – paper as an age-resistant data store medium

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Received: 10 March 2023 – Revised: 17 March 2023 – Accepted: 18 March 2023 – Published: 6 September 2023

Abstract. Humankind is known to be curious and inquisitive. Even if the code were lost, future individuals would be eager to find out what kind of message a printed paper offers. This was already the case when hieroglyphs were deciphered.

Printed paper does not need additional equipment to be recognized as a data carrier. Therefore, paper as an analogue data store medium provides an interesting redundancy to deliver important information to future generations. The presentation deals with topics of age resistance of paper and inks as well as recommendations of how to empower printed or written paper to be a long-term data store. Different ageing conditions, different inks, different printing processes, and different fibre sources reveal the opportunities and threats. Data obtained during a 2-year-long project together with BASE (Bundesamt für die Sicherheit der nuklearen Entsorgung – Federal Authority for the Safety of Nuclear Waste Management) on the long-term stability of paper (Langzeitbeständigkeit von Papier – Labest Papier) emphasize the feasibility (Arbeitsstandberichte AP1–AP3 (literature, typical damage, recommendations), unpublished data).

The ageing mechanisms of paper are known, as are countermeasures. This leads to standards and recommendations for the use of paper for documents. ISO 9706 (1994) is the main proponent of the direction that longevity can be ensured solely via the composition of the paper and the initial situation at the beginning of ageing. DIN 6738 (2007), on the other hand, takes as its basis the approach of assessing the physical ageing of the paper based on artificial ageing and the strength losses observed in the process. Other standards vary the approaches somewhat or mix them in part, for which the lecture presents a comparison table.

The usability of a document depends on two essential factors. Firstly, the residual strength after an ageing process must be high enough for the document to be usable. Secondly, the information written on it must still be legible or at least recognizable (ISO 11798, 2023).

However, although certain fibre resources that are recommended by different standards dealing with the long-term storage of documents as well as some fibre sources are denied, we must consider that all fibre sources undergo an ageing process. Different combinations of fibre and ink will lead to different results after natural or artificial ageing. This does not necessarily mean that only the best combination is able to fulfil the requirements related to transport information to an address in the far future. Albeit less strong or with higher optical changes, even by current standards, a rejected fibre source may nevertheless be able to keep the printed information over a long period of time.

Paper has been a proven reliable information carrier for approx. 1000 years as the oldest known paper document archived in Palermo is from 1109 CE. It is reasonable to expect a reliability for many more years because the “Ebers” papyrus (worldwide longest, complete, and best-preserved papyrus scroll) stored at the University of Leipzig is already 3500 years old. Compared to modern information storage media such as digital media or microfilm, paper also has the advantage of a long migration time and that no reading or decoding device is necessary. Taking this into account, paper documents are predestined to play a major role in record, knowledge, and memory (RK&M) strategies, as described by Pescatore and Palm (2023).

Finally, it remains to say that there can never be an intactness in the sense of being completely untouched. Paper, however, is a material consisting of natural polymers that prove their longevity in the world's oldest tree, a 9500-year-old spruce in Sweden.

References

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