

Contemporary Papermaking in the Tradition of Mahatma Gandhi

Martin A. Hubbe ^a and Kavya Madappa ^b

This editorial draws a parallel between important papermaking innovations that were implemented by Mahatma Gandhi and some more recent ventures in papermaking in India. Both of these examples share common themes of fostering the skills of local people, using local resources, and contributing to a better future. A key insight is the scaling of the equipment to be well matched with the size of the production team and enabling a broad range of product grades. The case study considered introduces a modern twist – using papermaking to achieve circularity in the production of textiles. As in the early days of European papermaking, once again waste textile products are serving as the primary source of material.

DOI: 10.15376/biores.19.4.6979-6982

Keywords: Appropriate technology; Regional autonomy; Textile fiber recycling; Agricultural residues

Contact information: a: Department of Forest Biomaterials, North Carolina State University, Campus Box 8005, Raleigh, NC 27695-8005 USA; b: Founder, Bluecat Paper – 100% Tree-free paper, C-26, KIADB Industrial Area, 1st Phase, Kumbalgodu, Bangalore – 560074, India;
Corresponding authors: hubbe@ncsu.edu; kavya@bluecatpaper.com

Mahatma Gandhi's Contribution to Papermaking

In the context of heightened political tensions around the world, it is illuminating to consider the role of a key historical figure who advocated for greater fairness among peoples, as well as for a non-violent approach to solving great problems. Some readers may remember seeing photographs of Gandhi operating a spinning wheel. He was showcasing the dignity with which people within their own regions of the world could create yarn from local resources, thus supporting a local textile industry.

Likewise, in his advocacy of regional papermaking, as a means to oppose the monopoly held by British paper goods in India in those days, Gandhi was a doer, not just a talker. Working with a perceptive technologist, Gandhi implemented a papermaking system that struck a balance between traditional handmade papermaking and concurrent measures to achieve a dramatic scale-up of production rates. A system of pulleys and weights made it possible for the papermakers to wield very large handsheet molds without excessive effort. That scale of technology also proved to be a good fit for the customization of the paper products, making it possible to meet individual needs of different customers. Some of the paper that was made at Gandhi's ashram in Sabarmati was used in printing the first constitution of the modern state of India.

What Would a Modern Gandhi Look Like?

Handmade papermaking is alive and well throughout the world, but most participants in the craft continue to use small-scale sheetmaking equipment. Some modern hand-papermakers have elevated their craft to an artform, with a focus on making individual items of beauty. Others have focused on the usage of local plant materials, with an emphasis on making eco-friendly paper products of unique character. In North America,

many such artisans are associated with the North American Hand Papermakers (formerly Friends of Dard Hunter) organization.

Gandhi, if he were to visit a current papermaking operation, either handmade or industrial scale, might again consider the question of appropriate technology. Is there a scale of technology that could create value for regional people, having a chance for economic viability, but not requiring the huge investments associated with those used by the leading pulp and paper companies of today? Is there a way to operate a papermaking system in such a way as to bring attention to important issues of the time, such as the need for green technology, including the recovery and usage of waste materials from other industries, such as waste textile materials?

Bluecat Paper LLP as a Case Study

Bluecat Paper, situated in Bangalore, India, has recently undergone a transformation from a relatively primitive single-cylinder forming operation to an updated system with a newly constructed Fourdrinier paper machine. The operation would be regarded as “pilot-scale” by most industrial papermakers. In other words, a paper development team at one of the world’s leading paper companies might make a limited amount of product using such a system so that they could show it to a potential customer. They could, for instance, run some print tests as a means to promote a paper product, or at least to convince themselves that they are ready to attempt a scale-up, with the paper being produced on one of their fast and wide paper machines. Bluecat Paper has done something different, in a striking way. They have selected a scale of operation that fits well with their staff and space. In addition, they are collaborating with local textile manufacturers and farmers to supply their operation with the needed materials.

Back before there were Fourdrinier paper machines, or their cousins such as cylinder paper machines and gap-formers, most paper in the world was made by the recovery and recycling of textile products. Rag collectors would come door to door in England and elsewhere to collect material to be repulped and made into paper. But eventually the emerging scale-up of mechanized paper production overwhelmed the available supply of rags. A whole new technology of obtaining papermaking pulp from trees was invented and perfected, and that approach has remained dominant in the world up to the present time. A key initiative at Bluecat Paper has been to use pre-consumer wastes from regional textile manufacturing operations as a main source for their material. Yes, it can be quite hard to convert cloth back into fibers suitable for papermaking. In the renaissance years of papermaking, the common approach was to place textile scraps in water in the basements of buildings, allowing enzymatic activity to weaken the cloth over the course of a few weeks. A modern approach, to save time, can involve “steam retting,” followed by beating (refining), using modern equipment.

While cotton from pre-consumer textile wastes constitutes the major component of most Bluecat products, agricultural residues provide fibers for some of the paper products. These include banana stalk, lemon grass, and spent barley. The vision is to provide options of tree-free paper by recycling massive amounts of residual by-products that have increased due to high volumes of consumerism. India is a country rich in biodiversity. It is one of the largest hubs for manufacturing clothes in the world. It is also the largest populated country. India uses over 35 million tonnes of raw cotton every year for manufacturing textiles. During the manufacturing process, there is 3% to 5% wastage of cotton fabric that is called ‘chindi.’ These are secondary waste off-cuts that end up in landfills, dumps, or to make

yarn. At Bluecat Paper, chindi is collected from textile factories nearby, color sorted, and readied for the beating process. The local (both male and female) population is provided with training programs to elevate them from unskilled to semi-skilled status. They learn fiber preparation, sheet formation, and other paper-making processes. This is empowerment of a special kind, equipping the employed staff to create tree-free, eco-friendly paper. This is truly a Gandhian approach to reduce and recycle. In addition, paper is also made from vast available agricultural residues such as lemon grass and spent barley from beer brewing companies.

Lemongrass is a mostly perennial plant. It grows in several states in India and is harvested multiple times a year. It is primarily cultivated for lemon grass oil. After the extraction of oil, the residual grass is a by-product that is often discarded. At Bluecat Paper, the grass is collected from farmers, cleaned, chopped, steamed, and then beaten in a Hollander beater along with cotton linter and cotton rags as fillers for added strength. Both papers are 100% natural and a great example of upcycling local materials and the conservation of trees. In addition to printing, writing, and packaging, the other applications are gift wrapping, bags, stationery, and clothing tags. This is a great example of upcycling, as this residual waste is often burned down and can contribute to pollution and landfill waste.

Sustainable and Efficient Paper-making Process

Bluecat Paper recently introduced a new Fourdrinier system for converting residual by-products into paper. The process begins with color sorting. This is an important aspect, as this helps retain the color of the fabric, since it already contains the needed dyes. Therefore, grey cloth = grey paper. This is followed by chopping, steaming, and then beating in Hollander beaters. The pulp is fed into the headbox of the Fourdrinier, which enables sheet formation on the wire part. Figure 1 shows a view of the forming device, looking from the top.



Fig. 1. Fourdrinier section of the new paper machine system

Thereafter, the paper is dried *via* steam and passed through a calendar section for the smoothing process. The paper is formed in rolls of deckle size 1000 mm and can be cut to optimum sizes depending on customer requirements. The water used goes through primary treatment and is recycled back into production.

The absence of added chemicals makes the recycling process of water more efficient than in mainstream paper mills. The Bluecat Paper operation also enables large textile manufacturing industries to adopt practices of zero waste and circular economy by converting their waste off-cuts into paper that can then be reused as tags, paper bags, wrapping paper, and packaging for their own consumption. This reduces the burden on trees for paper and is truly a remarkable way of creating sustainable products for effective use and minimizing agricultural and textile by-product waste. Mahatma Gandhi famously advised us to not look upon the natural resources – water, air, land – as inheritance from our forefathers. Rather, we should consider them to be “loans” and safeguard them for future generations.

Figure 2 shows some of the products from the mill, including some items that have been printed. In each case shown, the main component is cotton.



Fig. 2. A range of Bluecat paper products. A: sample-book items, including some with agricultural residues and denim; B: Gift wrapping paper (after printing) made from grey textile offcuts