

**PAPER RECYCLING, AN OLD BUT STILL EFFECTIVE SOLUTION**Amir Khosravani,<sup>a</sup> and Mehdi Rahmaninia<sup>a</sup>

Rising paper consumption due to growth of the world's population along with enlarging diversity of paper applications are putting more harvesting pressure on limited natural resources of the planet. Moreover, efforts to reduce papermaking effluents and the disposal of waste paper as a solid waste material are causing other environmental concerns. Paper recycling can reduce the volume of solid wastes while producing a main product with less raw material and energy costs. In this respect, to achieve a great recycling performance, the roles of an effective waste paper collect/bring system, governmental support and publicity for recycling should not be neglected. On the other hand, extensive research and technical progresses have helped to overcome some problems encountered with the recycled paper quality. Consequently, paper industry can rely more on an effective solution as recycling.

*Keywords: Paper Recycling; Waste Paper; Environment; Paper Consumption.*

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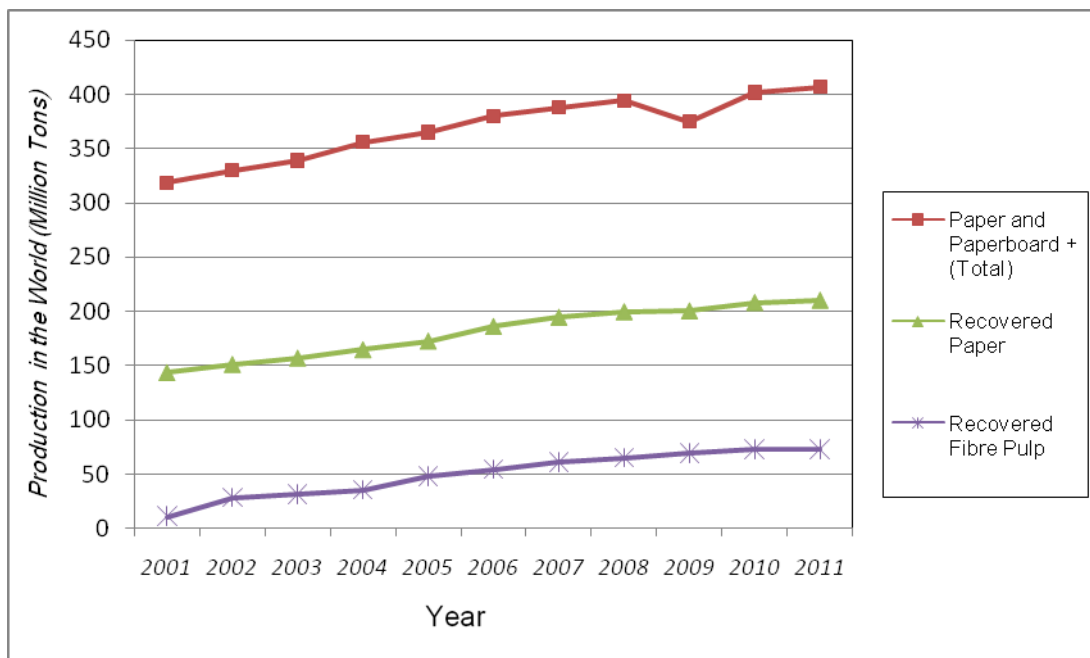
Up to now the world has experienced an ever-growing population which has increased the pressure on natural resources of the planet. This pressure has been intensified, especially following the industrial revolution in the 18<sup>th</sup> century. On the other hand, development of literacy, printing technology (books, magazines and newspapers), packaging industry, etc., have accelerated the growth in paper consumption per capita. Even introduction of electronic media (*e.g.* the Internet) and office automation systems, which had been expected to reduce the relative importance of paper, have not had that effect so far.

Hence, to meet the demands of a growing paper consumption rate, more production has been motivated. Natural forests and planted timberlands as main supplier of lignocellulosic raw material have had to bear more harvesting pressure.

Environmental harm has not been limited to severe exploitation of forests. In addition, a huge amount of effluent released from the papermaking process, as well as and waste paper which is discarded cause additional problems. Difficulties to find more disposal landfill sites, air pollution resulted from burning the solid wastes, *etc.*, can be mentioned as some other instances.

Therefore, the reuse of waste paper can be still an effective solution to provide necessary raw material for this large lignocellulosic-demanding industry, with less costs, while turning a type of solid waste into a main product and to overcome environmental challenges caused by this waste material. Figure1 demonstrates the amount of recovered

pulp and also paper, compared to increasing trend of produced paper and board in the world.



**Fig. 1.** Trend of total production of paper and paper board, recovered paper, and recovered fiber pulp in the world (FAO, 2012)

Moreover, as it is inferred above, paper recycling has always been driven by economical issues. When paper is made from recovered fibers, raw material costs are less of an issue. Also, the process is less reliant on energy-demanding operations such as kraft pulping or multi-stage bleaching. In this regard, it is important to emphasize that paper recycling faces various challenges and might itself result in environmental impacts.

One of the key necessities of the paper recycling industry is a well-designed and systematic waste paper bring/collect program and sorting system. This system will not work without some essential support of governmental rules and facilities. Also, cultural publicity will help the success of the system. In this respect, valuable experiences are available with "Blue Box" collect system in USA, "die Grune Tonne" collect system in Germany, "igloo" bring sites in England, and similar programs in Japan Well-sorted waste paper and careful attention to grading and classification systems will notably reduce the problems encountered during fiber recycling process.

Also, fortunately to ease the technical difficulties, great developments have been achieved regarding how to remove or treat contaminants such as ink stains, stickies, and other contaminants. Flotation cells, washing systems, slotted screens, kneaders, refiners, and cleaners, all can help to solve certain problems.

Ultimately, although the world's population is growing and paper's diverse utilizations are expanding more and more, recycling should be encouraged to take on a larger share of the product mix offered by the paper industry.