

Wealth from Waste. Sunil Khanna and Krishna Mohan, eds. Tata Energy Research Institute, Darbar Seth Block, Habitat Place, Lodi Road, New Delhi 110 003. 1995. Price: Rs 350. 280 pp.

From the title, I expected to find a series of articles, focussing on opportunities to convert waste into wealth, perhaps giving a picture of how much wealth is waiting to be tapped. But the book does not do that. It is based on the outcome of a workshop held in 1994, supplemented by some commissioned articles.

The foreword stresses reuse of materials and consequent addition to wealth. The preface talks more of cleaning up of environment. This twin objective has resulted in the book being a collection of articles, without the articles being woven into a 'story'. To me the most significant of the contributions can be woven around sugarcane to illustrate better, how wealth can be made from waste (and is being done industrially). The sugarcane is one of the most efficient users of sunlight in covering solar energy into biomass. The cultivation of sugarcane has been characterized by the wasteful use of water practised by most farmers, which not only is a waste of scarce water, but also produces salinity of the land. This is the first action point – the use of water in modern practice has been substantially reduced by drip irrigation and also the yield is increased and the soil quality maintained.

The sugarcane when it is ready for harvesting, has some green leaves good for animal fodder, but the part which is not suitable for animals is cut and left in the field, to be burnt or ploughed under. This could be considered for vermicompost, (as per the work of M. R. Bhiday, chapter 8 – perhaps generating biogas as well). The cane goes to the village jaggery unit or the big sugar factory. Early in history, and even till about 30 years ago, the bagasse, fibrous residue after

removal of sugarcane juice, was used only for burning as fuel and some 'mud' removed from the jaggery pan or the molasses in the factory used to lie around and produce the bad smell so characteristic of sugar factories even now.

About 30–35 years back, the realization came in the sugar industry, particularly in Maharashtra, that by proper management of the processes, one can produce more sugar and less waste. Getting more juice out of the cane left a better bagasse that has a good demand for paper production. At the same time, by proper use of the steam generation processes, the sugar mill is a net producer of energy and not a consumer, and many sugar factories distribute surplus electricity to villages around. They are practising the cogeneration that Dadiich talks about in chapter 3. The use of steam is done by multiple effect evaporators, which means the waste heat in the evaporated water is recovered and used time and again. This is the message of Srinivas Rao in chapter 5, but he deals with applications where his company has experience, viz. hot gases to water/liquid. He does not mention multiple effect evaporation, which is conventional, nor recovery of waste flue gases in the small wood burning chullahs. These latter are a big resource going waste.

This still left the molasses in the field; such a low value produce that the storage was only in ponds not in any tanks. Then came the use of the molasses for fermentation to make alcohol and its derivatives. There was a time when Indian alcohol was converted into polythene (before the petrochemical wave and synthetic ethylene replaced natural alcohol). So the fermentation alcohol now goes mostly for potable products. The molasses, that stinking product lying around the sugar factories in ponds, has many valuable uses from animal feeds to potable alcohol and many chemicals and pharmaceuticals, through fermentation routes. Is there

any better example of wealth from waste?

But that is not the end of it. After making the alcohol and distilling, the spent wash is again a nasty effluent. Now we hear in Jalgaonkar's paper (chapter 13) about the fermentation process whereby the spent wash is converted into biogas and an effluent that is good for the farms (sugarcane?) and the sludge is a rich manure too! The paper of Jalgaonkar does a good job showing feasibility of using spent wash from the distillery to generate biogas. Abdullah Khan illustrates the same technology in relation to the cleaning up of Ganga or for that matter any public sewerage system. There are other papers dealing with fruit waste and also the theory of methane generation and microbial action in composting – all operations already in the sugarcane processing as described above. The paper by Joseph is unique in that it describes how wealth can be generated not just from the waste, but also from the commercial transactions involved. It is a novel scheme of 'tradeable permits' for polluting industries; it is based on the law of diminishing returns and brings some optimization of societal costs keeping the target pollution level for a region the same. The idea is apparently in trial in some other countries.

There are some other papers, dealing with the legal issues, and landfill requirements, hazardous wastes, etc. In summary, the book is a collection of papers of varying relevance, that collectively do not convey the message of wealth, waiting to be tapped. Perhaps the story of sugarcane could have been used to weave the different papers together to make the message more effective. But then that is not the way seminars are arranged!

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