Brief overview on pilot scale projects and test series on nappy composting in Northern America

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Activity:	Connecticut project, carried on in Fairfield and Greenwich in 1992
Objective:	Try to find out how much of the organic detritus generated in the typical household could be turned into useful compost
Implementation:	Initiative of private industry (Procter & Gamble) and an environmental group (Greenwich Audubon Society). Other collaborators were the Connecticut Agricultural Experiment Station (also been involved in designing the research), the Town of Fairfield and International Process Systems and Waste Management of North America. Why Procter & Gamble ? Large quantity of sanitary products used in kitchen and the bathroom are from this company. One of those products is Pampers; disposable diapers are used on about 85% of American babies.
Approach:	Some 500 families in Greenwich and Fairfield were recruited who agreed to separate compostables such as food garbage, cardboard packaging, and disposable diapers, into paper "wet bags" lined with biodegradable cellophane. For a month, these bags were picked up by regular trash haulers and taken to the municipal composting facility, already in use for rendering municipal sewage sludge into compost. Several local McDonald's restaurants got involved, adding soggy coffee grounds to the mix. The composting facilities are vast halls, containing (in Fairfield's case) six 220-foot-long bays. Compostable materials such as shredded carrot tops, Kleenex, diapers and pizza boxes in the case of the pilot project are being dumped into one end of a bay. The material has to be moved along the bay to come out the other end as compost, and it has to be turned, just as a backyard compost pile has to be turned. This is done with a mixer-agitator, a huge machine that moves along the top of the bay on tracks. Like a vast rototiller, it reaches 5 feet down into the steaming mass, turns it over and moves it 12 feet toward the finishing end of the bay each day. In the composting facility, the material has to be kept at 55°C for at least three days in order to kill pathogens. The total composting process takes about three weeks. The Experiment Station tested the material all along the way, using physical, chemical and biological parameters to determine its quality and maturity. According to the responsible Chief Soil Chemist the material "broke down amazingly fast". The Station also analyzed the compost at the end of the process to determine whether pathogens were present and for metals and other inorganic elements. These were found to be well below EPA standards for the unlimited application of sewage sludge to agricultural land. Further analyses at Woods End Research Laboratory in Maine found high levels of nutrients (nitrogen, phosphorus, potassium), low levels of metals and no pathogens.
Documentations	"Wet Bag Composting Trial Yields Promising Results," (with Lauren DeChant, Margaret Conditt and Bruce Jones), *Biocycle*, April 1993 "Wet Bag Composting Report" (with M. Conditt et al.), Audubon and Procter & Gamble Report, September 1993.

Activity:	In November 1996, Metro Toronto (Canada) cancelled a program on diaper and napkin recycling that serviced 200 daycares, special-needs schools and women's shelters because the already exorbitant $400-per-tonne costs were expected to rise above $500 per tonne the coming year. Metro still decided to continue running seven diaper collection depots despite the fact that increases in collection and processing fees nearly doubled. To recycle disposable diapers costs Metro 57 percent more than to collect and dispose of municipal waste.
Implementation:	Metro was supposed to complete four pilots that were operating in Etobicoke and Scarborough. One, which offered source-separated diaper collection to 1,100 Etobicoke households as part of weekly waste pickup, was expected not to be extended after completion. In the others diapers were collected as part of the recycling stream in "maximum diversion" demonstrations in neighbourhood communities and apartment buildings. The result is that collection of diapers is feasible but costs threaten the programs. Orillia's curbside diaper recycling, the first full-community program in Ontario, is also concerned about the program's viability. It costs Orillia $155 per tonne to recycle its diapers, 60 percent more than it would cost to landfill them. High costs, including a $50-per-tonne processing charge being levied by Mississauga diaper recycler Knowaste Technologies, pose a serious treat to Ontario's diaper recycling programs.
Approach:	Much of the debate is centred on the best way to deal with disposables. Knowaste has demonstrated that they can be recycled. Confidence that large-scale composting or burning is the solution is rather low, however. That said, recycling costs have to be within reason. Industry stewardship can be a solution but the crux of the problem is to develop a stewardship model that will accommodate every community's needs. Each community has to look at which system – recycling, composting, incineration or landfilling – is best for them.
Documentations	n.a.

Other facts about nappy disposal

- The average baby goes through 5,000 diapers before being potty-trained. Because 95 percent of these diaper changes are disposable diapers, most of them end up in landfills.

- Diapers made up 3.4 million tons of waste, or 2.1 percent of U.S. garbage, in landfills in 1998 (the last year this information was collected, according to the Environmental Protection Agency).

- According to Procter & Gamble research, diapers comprise about two to three percent of the total waste stream. A small composition study done in Canada suggests diapers make up 4.8 percent of the garbage stream. And data from Centre and South Hastings (Canada) even indicate that diapers

are the largest component of the waste stream after recycling, comprising between 12 percent and 29 percent.

- Diapers in landfills in underdeveloped countries are especially problematic because they often aren't properly disposed, and excrement leaks into the local water supply.

- New biodegradable brands are for example made of cornstarch instead of plastic. They offer only slightly better options however, as contrary to popular belief, no diaper -not even biodegradable ones- can break down in an airtight landfill. Also the availability of biodegradable plastics like Polycaprolacton and their use for sanitary napkins has not led to a breakthrough for the composting of diapers until now.

- Diapers all contain super-absorbent gelling materials, or AGM. This gel-like absorbent substance used in disposables is sodium polyacrylate.
  THE INSIDE SCOOP ON DISPOSABLES: Wood pulp: 65 - 70%
  Plastics: 20 - 25%
  Super Absorbent Polymers: 5 - 10%

- A composting laboratory developed by Procter & Gamble to evaluate the "compostability" of their paper-based products and packaging used a series of 30 large reactors and simulation models to predict large-scale results. The one-of-a-kind lab was given away to the LSU AgCenter after Procter & Gamble had claimed that it has demonstrated that diapers are compatible with that composting process." *(Remark: No publications on the results of the tests conducted with the lab have been found so far)*.

- Since 1990, P&G has allocated $3.5 million to diaper composting research in Canada. According to a 1994 article in The Globe & Mail, the money spent or allocated to date was "equivalent to about one-10th of one percent of one year's sales in Canada. In one P&G study, for example, the percentage of diapers in the compost mix was successfully increased from two percent to seven percent *(Remark: this result is quoted in one article but the source is not specified)*.

- While it is largely recognized that the majority of a disposable diaper is compostable the major problem is that of the plastic outerpad and closures ("compostable part carefully packaged in uncompostable plastic"). The few Canadian facilities that compost mixed waste, including diapers, are said to experiencing the effect of that "packaging" problem. Among the problems quoted are: that bundled and taped diapers are too big to pass through the trommel screen and only about 10 percent of disposable diapers end up as finished compost. Ironically, this compost is just good enough to be used as cover on the landfill where the other 90 percent diapers are disposed of.

- Also manufacturers of disposable nappies in other countries (such as the UK and Germany) have invested large amounts of money into looking at alternatives to landfill. These include composting and biogasification, both of which work but are not as yet widely available.

- Studies on nappy composting are known from Germany *(Remark: The P&G study mentioned)*, The Netherlands, France, Belgium, Switzerland, Austria, the US, Canada and South Korea. The main conclusions were that napkins and other paper products are suitable for various composting methods and biogasification processes. For these processes, disturbing materials such as plastics must be separated from the biodegradable matter or removed (as in the case of compost) afterwards. The techniques used for that are known from the mechanical pre-treatment stage of composting installations dealing with mixed solid wastes. Application in practice is very differentiated (Austria with a share of 24% composting in nappy disposal takes the lead) and strained by high costs.

- A pilot on industrial scale composting of disposable napkins initiated by the company Helen Harper in Schwabach near Nuremberg, Germany in 1992 proved the feasibility and showed no negative effects on the end-products. Despite this result, the German technical commitee for waste management does not recommend napkin composting.

Known publications

Jager, J., Obermeier, T., von Ohlen, S., 1990, „Co-Kompostierung von Höschenwindeln und Bioabfall im Kompostwerk Allar.“ Endbericht, ITU (Ingenieurgemeinschaft technischer Umweltschutz GmbH).

Rittmann, B.E., Sutfin, J.E., Henry, B., 1992. Biodegradation and sorption properties of polydisperse acrylate polymers. Biodegradation, 2:181-191.

Little, A.D., 1992. „Report on Disposable Diaper Recycling Program,“, United States.

Gellens, V., Boelens, J., Verstraete, W., 1995, Source seperation, selective collection and in reactor digestion of biowaste. Antonie van Leeuwenhoek, 67: 79-89.

Verschut, C., Brethouwer, T.D., 1994, TNO-report „Composting of a mixture of VFG waste and used paper diapers“.