

Facility for the selection of separated dry municipal waste fractions and of industrial non-dangerous waste with recycling of the residual process derived waste Suggestions for “Zero Waste” Strategy

Part One - Vedelago Recycling Centre

This report follows a visit to the facility and contains a revision of data kindly provided by the firm and of some documents written by various persons, among them Gianluigi Salvador representative of WWF in the Veneto Region for energy and waste, Fabio Tomei of the Coordinated Environmental Associations in East Piemonte and others.

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Presentation

The Vedelago Recycling Centre, Via Molino 17 – 31050 Vedelago (TV) tel: 0423 700178 (Manageress Carla Poli, Sole Administrator Alessandro Mardegan) was established in Monselice in 1990. In 1997 it moved to Vedelago, taking the name Vedelago Recycling Centre and working for the Priula TV 2 and the TV 3 Consortiums, which had started planning for door-to-door waste collection in 2000. Currently it has a balance of 5 million euros and is progressing towards 6 million. At present it employs 58 persons, 7 of which doing office work, the others divided into two workshifts.

Initially it consisted of a small factory shed located in the industrial area of Vedelago, but later, in 2003, with the increase in the amount of materials coming from waste separation, the Recycling Centre was expanded in order to meet the requirements of the area it served and new technologies were introduced to process the residual waste left over after the selection of the marketable materials.

The Province of Treviso approved the expansion plan and in June 2004 the Centre moved again, this time north of Vedelago to the Postumia Road. Specifically it is located on the bottom of one of the many gravel - pits that can be found in the area, 4-5 metres below ground level and it covers an area of 35.000 square metres. The Centre is made up of three buildings. In the oldest one, which was built in 2004, the dry materials which come from source separation of waste are selected and baled. This process produces residual waste, mixtures mainly of plastics, which are processed and extruded using heat in the newest building, built in 2006. In front of this second building there is a third one with offices and, on the ground floor, a hall where meetings are held and where the many school children who come to visit the Centre (about 2100 a year) are welcomed.

In 2004 the Centre was awarded its Quality System Certificate for compliance of its production process with the UNI 9001 standard (check of design and production processes); then in 2005 it was awarded the Environmental Quality System ISO 14000. This is important because it guarantees that its high quality procedures and connected activities are kept at the achieved standard. Neither bad smells nor noisiness can be detected outside the buildings.

Both the dry materials which come from source separated waste delivered by municipalities, Consortiums or by single businesses and the selected and packaged materials ready for consignment are kept outside the buildings because storage time is usually quiet brief. The Centre receives source separated materials from the province of Treviso (Priula Consortium, TV3 Consortium and single municipalities), from the Province of Belluno (Feltrino Comunità Montana, Valbelluna Comunità Montana etc.) from the Asiago Upland and other municipalities of the Vicenza area, from Faenza, Imola and other 17 neighbouring municipalities.

The Centre is equipped to meet requirements even in case of emergencies occurring in other places (for instance for a period of eight months the Centre received source separated waste from about a hundred municipalities of the Trento area, when their selection centre was damaged by a

fire). Moreover there are about 300 private industrial and commercial businesses, mostly from the Province of Treviso, which deliver their waste to the Centre. It is a facility which can be suited for door to door collection of non hazardous industrial and agricultural waste. For example, Valplastica SpA of Fontaniva delivers 2.500 t/year of waste and gets back about 800 t/year of selected PET plastic.

The selected materials are sent to about 45 different facilities, 23 for the plastic fractions, 1 for glass, 2 for aluminium, 2 for stainless steel, 2 for wood, 5 for paper and cardboard, 3 for WEEE (waste electric and electronic equipment), 3 plants for the recovery of inert materials and 1 landfill for the residues.

The Centre also sells the recovered materials (plastics) abroad: Holland, Austria, Slovenia etc.

The Centre has agreements with all the Recycling Consortiums (except Cobat for used batteries): Corepla for plastics, CAN for metals, Cial for aluminium, Coreve for glass, Comieco for paper, Rilegno for wood. It also receives and immediately sorts out some inert materials which it receives from various municipalities and which it sends on to the recyclers.

How the separated waste fractions are selected

The Centre selects and processes about 22.000 t/year of dry recyclable fractions, primarily plastics, glass and aluminium, equivalent to an average 80 t/day. The processing of these dry recyclable fractions corresponds to serving about 1 million inhabitant equivalents. The tables that follow show the amounts that have been processed and the destinations for the period 2003 – 2007.

	Year 2003		Year 2004		Year 2005	
	tonnes		Tonnes		Tonnes	
Initial stock	472.225		675.149		694.905	
Waste delivered to the Centre	18,600.825		17,275,264		22,671.074	
Waste sent to recovery of materials	15,990.778	86.91%	15,289.566	88.61%	19,945.689	89.04%
Waste sent to energy recovery	14.320	0.08%	126.820	0.73%	454.160	2.03%
Waste sent to landfill	2,045.977	11.12%	1,473.520	8.54%	1.643.140	7.34%
Amount lost during processing	346.826	1.89%	365.602	2.12%	356.059	1.59%
Final stock	675.149		694.905		966.931	

	Year 2006		Year 2007	
	Tonnes		Tonnes	
Initial stock	966.931		961.892	
Waste delivered to the Centre	21,061.315		22,022.158	
Waste sent to recovery of materials	18,893.310	89.69%	21,117.480	91.07%
Waste sent to energy recovery	341.160	1.62%	75.300	0.34%
Waste sent to landfill	1,147.040	5.44%	1,069.090	4.84%
Amount lost during processing	684.844	3.25%	827.467	3.75%
Final stock	961.892		894.713	

The yields

Please note that waste disposal at the Centre is decreasing and ever since the extrusion system for leftovers coming from the selection of municipal and commercial waste started working at full capacity, the residual waste has dwindled, reaching 1.5% during the first months of 2008. Therefore waste disposal and related costs have been drastically reduced by producing a sort of “granular” material or synthetic “sand” which is sold to local businesses in the plastic moulding or in the construction sectors, in the latter case to be used for concrete mixtures and for cement products.

Selection is performed essentially using two ingoing streams, in both cases selection is mainly performed by hand from conveyer belts, which carry six different combinations of dry recyclable fractions made up of either mixed or single materials, such as mixed materials with or without glass obtained from door-to-door or from kerbside waste collection or directly from businesses.

However, before accepting incoming waste, the Centre performs a check on the waste collection method to make sure that the quality of the incoming materials is at an acceptable level for the total recycling process. To achieve this it collaborates with the municipalities in their effort to inform citizens and thus reduce the presence of unsuitable materials.

There is also a strict check on the incoming lorry loads, to verify where they come from and if the waste they carry is suitable for processing.

The selection system

Line 1 is used for “light – multimaterials”, i.e. mixed plastics and metals, plastic of a single type (bottles), mixed plastics (for example those which come from the TV3 Consortium)

Line 2 is used for “heavy – multimaterials”, that is glass/plastic/metals (for example from Priula Consortium), glass/plastic (from TV3 Consortium), glass/metals (from Vicenza)

A problem of some importance arises from the fact that glass is collected along with the so-called multimaterials. In fact the glass is shattered both during collection by the waste compactor lorry and during processing and the glass fragments wear out the equipment badly, moreover, fragments less than 3 cm are considered discards by the glassworks which buy the glass as a secondary raw material. The glass recycling consortium Co.Re.Ve. gives a monetary contribution to those who recycle glass, but only if that glass has been collected separately. (Indeed in Germany glass is separated at source according to its colour).

The main role of Line 2 is to remove the unsuitable materials, metals, aluminium and glass, so that plastics can be sent to Line 1 to be separated according to their type (meaning by this the type of polymer and the colour – there are up to 22 different types of plastics!).

In both lines selection is done by hand (2 workers for the 3 posts of Line 1 and 11 workers who select the plastics). The manual character of the work guarantees an accurate selection of the plastic types and this has led the Plastic Recovery Consortium to award the Centre with its Quality Prize; moreover some types of plastics (e.g. PE, PVC, vases, straps etc.) which could not be extracted using automatic methods, and would therefore become discards, can in this way be recovered and are easily marketable.

Thus selection produces many types of final products (e.g.22 different types of plastic) and their variety may be modified according to economic return and/or to market demands for the secondary raw materials which are continuously evolving and specialising.

The selected materials are high quality and contain less than 3% impurities, thus the CONAI reimbursement obtained is the maximum possible, while for other products, not within CONAI province, maximum market prices are attained, as price is always commensurate with the quality of the product.

The advantages of accurate selection are evident when we consider that the disposal of discards or the placement of RDF at incineration facilities costs more than 80 €/t, excluding transport costs, whereas the industrial cost of selection by hand at the Centre is about 50 €/t.

High quality plastic fetches about 400-500 €/t on the secondary raw material market, aluminium is paid about 420 €/t, ferrous materials about 82 €/t. The plastics selected according to their type are stored and delivered in 80x80x80 cm bales and weigh between 0.4 t in the case of bottles and 0.9 t in the case of plastic bags.

After receiving a written request, the goods are sent to the businesses which recycle them, in the case of some particular materials they are sent abroad: Holland, Germany, Austria, Slovenia and Switzerland.

The selected materials are kept stored for very brief periods, because the demand for high quality secondary raw materials is high.

As already mentioned, the granular product obtained by processing the leftovers after selection is used in the construction and plastic moulding businesses and it fetches between 30 and 80 €/t, whereas previously a cost of 220 €/t including transport had to be sustained in order to dispose of the discards either in landfills or by incineration..

How the leftovers from the selection lines are recycled

The previously described selection lines produce discards (organic waste, bulk items and end of conveyer belt residues), which amount to an average 42% of the source separated waste fractions delivered to the Centre by municipalities and /or Consortiums. These discards, which were once sent to landfills or to incineration, are now processed at the Centre, where they are sent to the extrusion line, along with discards from the selection lines, mainly plastics, sent by private industrial, commercial and handicraft businesses etc.

The following steps are performed at the extrusion line: check of the incoming materials - removal of ferrous materials – grinding – separation of ferrous and non ferrous particles – extrusion – granulation – screening.

The extrusion line processes about 2 t/h of the ingoing materials and it is active for two workshifts of 7.5 hours each

Some marketable goods (pieces of cloth, cans) are recovered while checking the incoming materials, ferrous materials are separated in the successive step. A further separation of ferrous and non ferrous materials (consequent to the presence of toys or other objects made from composite materials) is necessary after the grinding step. Extrusion of the “mixed ground materials” follows, during this step a temperature of 180°C is reached and little “chunks” of about 5 cm in diameter are produced. Humidity is removed during the extrusion process, consequently mass is reduced by about 18 -25% and simultaneously the extruded material is hygienised. The final steps are cooling, granulation and screening of the material to obtain three different sizes (small, medium and large) according to what the market demands.

The plastic moulding industry uses this granular material either by itself or mixed with other plastics to make benches, pallets, the basal part of office chairs, flower pot holders and quaterdecks, while the construction industry uses it in place of sand or inert materials in the mixtures used to make building products, kerbs, poles, or mixed with asphalt and other uses.

All tests and experiments have been carried out in collaboration with the labs of the University of Padova, finding that use of the granular material brings about improvements in the quality of the products (insulation, carrying capacity, soundproofing).

Checks on the materials entering the productive process and on the productive process itself guarantee that there won't be any toxic releases into the environment – or in homes- and this lack of toxicity is a further benefit

Finally the products made by businesses which buy and use this granular material have also been tested and have obtained UNI certificates and comply with current regulations.

All products made with these granular materials are recyclable or can be re – inserted into other productive cycles.

Tests on dry municipal waste residues

Tests were performed at the Centre on 150 t of pre-treated dry municipal waste residues from the Priula Consortium to find out if after extrusion they produce the same granular material as that obtained from the discards of the selection lines

It became possible to obtain positive results by adding discards, mainly plastics, to the pre-treated dry municipal waste residues.

In fact, product analysis showed that the pre-treated dry fractions contained excessive amounts of paper, textiles, metals, as well as of organic waste.

If one wishes to obtain incoming materials that do not need the addition of considerable amounts of other types of materials we suggest the following precautions:

- the incoming materials should be checked (deliveries from rubbish skips avoided) and selection of the recyclable fractions should be performed before pre-treatment;
- the removal of ferrous materials during processing should be increased;
- the presence of organic waste, which shows that citizens did not perform source separation of their waste carefully, should be much reduced by launching appropriate information campaigns and by collecting nappies and incontinence pads (which make up about 20% of the dry residual fraction just by themselves) separately and processing them in a different way.

If the above described suggestions are followed it would become possible to send even the residual dry municipal waste fraction to the extrusion line, obtaining a granular material with the qualities required for certification and use. To prove this theory, several product quality tests were performed using dry municipal waste residue fractions from different municipalities; product quality was found to be compatible with the recycling procedure used at the Centre, therefore, the plan is technically feasible.

Some important considerations for policymakers and stakeholders

The Vedelago Recycling Centre is one of many Italian facilities which select and enoble already separated municipal waste. The managers' experience and competence can help us in a general assessment and also assist in putting a "zero waste strategy" into practice in real terms. Now we will highlight some specific points which make this facility a better recycler than others.

1. **How to separate waste before sending it to the recycling facility.** Whoever is involved in placing recycled municipal waste materials on the market knows that waste streams should be collected separately right from the start. Even the Priula Consortium, which has been a guide in recent years, has been asked by the Centre managers to stop collecting glass, plastics and metals all together, as this leads to a greater amount of discards after selection, and to a high amount of discarded glass, because collection is performed using a compactor, which partly shatters the glass, whereas unbroken glass is requested by users. Moreover, the fact that Consortiums and businesses/public joint-stock companies tend to prefer quantity and increasing sales proceeds rather than the quality of collected waste is becoming a problem, making it more difficult to place the recycled products on markets. *Therefore municipalities must be encouraged to use community depots for recyclable and non-recyclable waste to separate industrial packaging, to prevent mixing industrial and commercial waste streams with source separated municipal waste, to increase source separation of waste even at the community depot itself and to apply pay as you throw tariffs to weighed bulk items, which often come with easily recyclable household and commercial packaging.*
2. **Quality of the residual waste.** Tests performed at the Recycling Centre, in collaboration with the University of Padova show that the residue obtained from the selection lines at the Centre is very similar to the mixed waste residue produced by families when advanced systems of door to door waste collection are used. The mixed waste residue (which amounts to about 20 - 30% of the total municipal waste collected when the above door to door systems are used) may therefore be recycled, provided that the organic waste amounts to less than about 5%. On the basis of test results, the owners of the Recycling Centre recommend that diapers should be collected separately, as this step by itself would keep impurities within acceptable limits, allowing processing to be performed correctly. *This is a great opportunity for policymakers and stakeholders to work on product analysis: to encourage experimentation aimed at removing heavy waste fractions which heavily affect residue waste weight; to remove organic waste and diapers (sanitary tissues.) by providing incentives for household composting and above all by introducing pay as you throw tariffs on the residue, with a "costly" variable share aimed at getting users to check the quality and therefore the weight of their residual*

waste. Several product analyses have shown that when separated dry – wet waste is collected without applying pay as you throw tariffs, the dry residue obtained contains a wet component which can vary between 5 and 15% in weight, plus an equivalent amount of sanitary tissues; *it is therefore necessary to compare the yields obtained from high efficiency source separate collection with or without the application of pay as you throw tariffs in order to minimize the presence of organic waste and to divert diapers towards specific collection sites for particular types of users, sending this stream of waste to disposal without polluting the dry residue.*

3. **Collection of plastics.** The best way to do this is by collecting each type of plastic separately at households, but the managers of the Recycling Centre remind us that the specifications of the Consortium officially in charge with this task (Corepla) only require selection of some types of polymer:

- CTL/M: transparent PET containers;
- CTA/M: blue coloured PET containers;
- CTC/M: coloured PET containers;
- CTE/M: PE containers;
- SELE-CAS/M: plastic crates;
- SELE-FILM/M: packing film.

Having chosen to recover only “bottles” and film, there is a very high amount of discards after selection, approaching 40-45%. This means that these discards, consisting of many types of poly laminated packagings, should be sent to incineration. Instead the Vedelago Recycling Centre selects 15 – 20 more types of plastics, which it receives from various private businesses, and for which they say a well-established market exists: flowerpots and saucers – cans - items made with ‘hard’ plastics – tubes – straps – mulch sheets – quarterdecks – transparent nylon – clean polystyrene – big bags – discards from bottle production – labels of the same type of polymer – light tubs – rubber of the same type of polymer – polyurethines – big sacks – various types of items before use.

With a modest financial and technological commitment, the Centre manages to recycle even the final discards after selection by mixing these materials with plastics which come from businesses (therefore these plastics should be sent to selection and not to disposal) by selling the product to plastic moulding businesses (which in this way cut their otherwise ever increasing supply costs, due to climbing petrol prices). This gives the Centre an extra profit, plus they avoid expenses for disposal in landfills or incinerators; the “synthetic sand” – as it is called at the Centre – complies with all the relevant technical rules and is periodically subjected to tests by ARPAV (the regional environmental protection agency).

In conclusion: do policymakers and environmentalists know that half of the plastics are sent to incineration and that by using a simple technology that amount may tend to zero, as it can be used to produce marketable regenerated products? Therefore pressure should be put on COREPLA and the local selection facilities to make them adopt the Vedelago Recycling Centre technology.

4. **Collection of municipal and industrial waste together with considerable intermingling .**

This is the third essential point which recyclers find fault with in waste management policies of municipalities, Consortiums and public businesses: in fact in this situation rather different waste streams, with different recycling potentials are mixed in a single waste stream which mostly ends up in RDF (refuse derived fuel) facilities and incinerators without undergoing high efficiency selection. If businesses performed waste separation at source, these materials could be recycled either in a homogenous form or in suitable mixtures which can be used to produce unfinished products with high quality mechanical characteristics for which there is a promising market. Instead we frequently see containers from several parts of northern Italy carrying bulk items, LDPE film discards from company packaging, rubber, different resins, HDPE cans, because the choice to make businesses separate their own waste at source was not made.

5. **Recycling provides many jobs.** Five million euros were invested in the Vedelago Recycling Centre and it employs almost 60 persons. The Brescia incinerator employs about 70 persons and it costs 300 million euros. Had this sum been invested in recycling centres over 3000 persons would have had a job! Besides being a high energy saving facility (energy saving is maximized through recycling), selection and regeneration policies generate job opportunities 50 times greater than those of disposal facilities, this must be made clear to policymakers and to lobbyists.

Assessing the Centre and its technologies

It's a flexible plant, which uses standard technology, it is innovative and easy to copy. Currently there are two plans to copy it in progress: one in Collesferro (the contractor is Talone) with the GAIA consortium (15 municipalities), here selection will be performed as in Line 1 of the Vedelago Centre. The second plant is at the work assignment stage in Tergu (Sassari) with the private and public partnership Anglona Ambiente Sardegna.

The owners of the Vedelago Centre managed to exploit their need to minimize disposal costs, by transforming a waste stream into an innovative, marketable product complying with relevant technical requirements. Their experience confirms that in the future investments should be made in the recycling of plastics, because there is a market for these products, and prices for raw materials are increasing exponentially.

The investment costs are not too high and provide jobs for many workers, who increase the quality of the product and make the whole procedure more flexible. Also thanks to the Quality System Certificates information and procedures have been transparent.

An efficient control system is used to check the incoming materials in order to maintain and /or improve the quality of outgoing products (wheel of continuous quality improvement typically found in quality systems: in fact the Vedelago Centre has even obtained quality certificates twice).

Owing to their high quality, there are no problems in placing the products on the secondary raw materials market and the demand increases continuously, especially on international markets. The greatest potentials are in the building, town planning and street furniture sectors.

The Vedelago Recycling Centre Srl is a private business and has not received any public funding, initially it invested its own capitals and then reinvested its profits in the business itself. To increase the value of waste they favoured a high quality in the selection procedure, with benefits in the number of jobs which increased from 4 workers initially to the present 58 employed.

Since it was established in 1997 the Vedelago Centre has developed thanks to its constant commitment to RESEARCH, STUDY and EXPERIMENTATION, it has also favoured keeping the citizens well informed, inviting SCHOOLS to participate in its plan: *Learning to achieve sustainable development.*

[End of Part One]

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