

ANNUAL REPORT 2012



1. Retrospective

The Foundation Auto Recycling Switzerland was set up in 1992 and has now been in operation for twenty years. An ideal time to look back at rather more of its history than just the last financial year. It also seems appropriate and important to remember the roots of our Foundation, partly because most of the decision-makers from those days are no longer with us.

From the present perspective it is hard to imagine that the Environmental Protection Act (EPA) entered into force as recently as in 1983. The EPA is the fundamental law on which many environmental ordinances are now based. The EPA aims to safeguard and protect the wellbeing of people, animals and plants as well as their living communities and habitats against harmful or detrimental influences.

When it comes to waste materials, the Technical Ordinance on Waste (TOW) adopted in 1990 became a kind of “Bible”. The article which is central to our Foundation concerned the ban on dumping organic or combustible waste in landfill sites. These included the residual materials from the shredder plants (ASR - Automobile Shredder Residue) which at the time originated largely from end-of-life vehicles.

Through an exemplary initiative, the members of the Association of Swiss Automobile Importers (auto-schweiz) then set up the Foundation for the environmentally-friendly disposal of motor vehicles; in 2001, this became the Foundation Auto Recycling Switzerland. Because of the ban on landfill dumping, the focus was placed on the thermal processing of shredder waste and intensive searches were made for suitable technologies.

The co-incineration of ASR in municipal waste incineration plants (MWIP) began in 1996. Trials with the admixture of up to ten per cent ASR with normal refuse did not show any major impact on emissions. The aim defined by the Federal Office for the Environment (FOEN) of obtaining an inert slag could not be achieved in this way. That is why the Foundation went on to evaluate the RESHMENT process developed by Voestalpine in Austria and started the project in Monthey (VS) in the year 2000. The criteria for synergies in the chemical industry park in that locality were excellent. The building permit was issued in 2004.

However, the Foundation had to halt the project for two reasons. Firstly the Swiss Federal authorities declined to grant the time-limited territorial protection explicitly provided for this case in the explanatory statement accompanying the Environmental Act. All shredder waste would have had to be delivered to this facility for a certain period. Secondly, the cost estimate far exceeded the financial limit. This would have made economically viable conduct of the business impossible. The decision was regrettable, but looking back still appears to have been the right one.

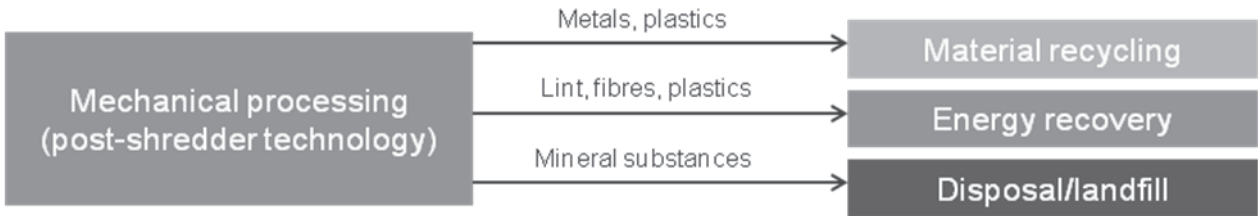
Since then the situation has changed. Thanks to the ongoing advances in MWIP development in the areas of flue gas scrubbing and energy recovery, the co-incineration of ASR is no longer a transitional solution but a solution recognised by FOEN. That is why no separate ASR recycling plants are needed.

In the twenty years since its inception, the Foundation has built up great expertise in relation to ASR recycling processes and technologies. In the first instance account must be taken here of the applicable laws which differ from country to country – even between the EU

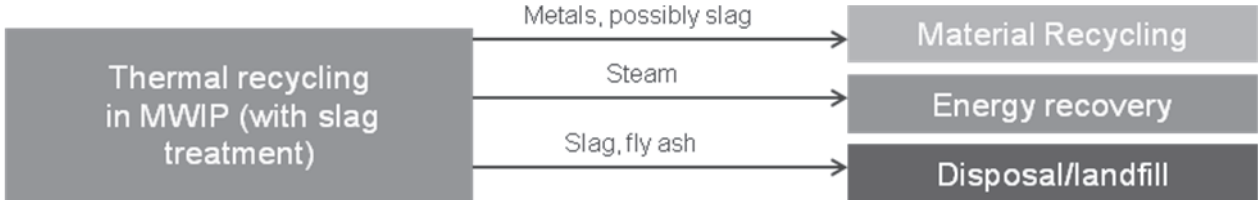
Member States – and lend themselves to varying interpretations. Moreover, economic and ecological conditions must also be borne in mind. The following conclusions can be reached:

- Systematic dismantling of vehicle parts for further recycling is expensive, not least because of the considerable manual labour involved and satisfactory demand seldom exists for the dismantled components on the recycling market. Catalytic converters and lead batteries are exceptions because of the valuable metals which they contain.
- ASR is classified in Switzerland as special waste and is a very heterogeneous mixture with an organic component of around 50 per cent. The other half consists of mineral substances and residual metals. Thanks to its relatively high calorific value of 12 to 18 MJ/kg (broadly similar to that of dried wood), use for energy production makes sense.
- There are essentially two approaches to the treatment of ASR:

1. Mechanical pre-treatment, material and energy recycling:



2. Thermal pre-treatment, material and energy recycling:



Both these routes have their advantages and drawbacks, which may differ from country to country according to the local legislation. Finally, even with a high degree of processing residual waste remains and has to be dumped in a landfill site. A hundred per cent recycling economy is an utopia and does not make sense either, because harmful substances must be eliminated. Vehicles have a long service life. On average they are on the road for 15.5 years. In certain cases, this means that materials which were once used, such as mercury, lead and cadmium, are now prohibited or subject to severe limitations.

- Both the valuable and problematic substances are located in the fine fractions. That makes processing complex, difficult and correspondingly expensive.

The world never stands still. Innovations make the breakthrough. That is why the validity of these statements must be reviewed all the time. For example, in recent years sensor-assisted sorting has boosted mechanical processing of waste. But even existing technologies - involving physical, chemical or thermal processes - have been and are being constantly

refined and improved. Nevertheless, the old adage about waste “What goes in at one end comes out at the other” remains valid.

Today the recycling of end-of-life vehicles in Switzerland is working smoothly. Vehicle recyclers and shredder plants are important partners who are under the control of the environmental authorities. Thanks to stringent motor vehicle testing, old vehicles are generally in such good condition that demand for them in other countries is strong. The export ratio is very high at around 50 per cent. Account must be taken of the fact that the exported vehicles are not simply disposed of cheaply and at the cost of other people, but remain in use for several more years. That contributes to mobility which hardly anyone could otherwise afford in these countries. And mobility is essential for a flourishing economy.

2. Activities

a. Centre for Sustainable Waste and Resource Utilization (ZAR)

In the meantime, the Centre for Sustainable Waste and Resource Utilization (ZAR) at Hinwil with a fine and ultra-fine slag processing facility for MWIP slag in the 0.2 to 5.0 mm range has been successfully commissioned and further improved. The quality of the non-ferrous metals which are sorted out is excellent so that good income has been achieved. The precious metals gold and silver have made a particularly important contribution, but they only originate on a small scale from ASR. Following the incorporation of the future operating company, ZAV Recycling AG, coarse slag processing is now also being effected. This enables the whole process to be covered and meaningful dimensional and energy balance sheets to be drawn up.

In the final phase, 200,000 tonnes of dry slag from the Zurich/Eastern Switzerland regions will be processed. Following metal recovery, ZAR will increasingly focus on the material recycling of the mineral slag component. After all, this represents 85 per cent of the dry slag. The first meaningful ASR trials are being conducted in 2013. By the end of 2014 at the latest the Foundation will know how high the recovery rate is from co-incineration of ASR in the waste incineration plant.

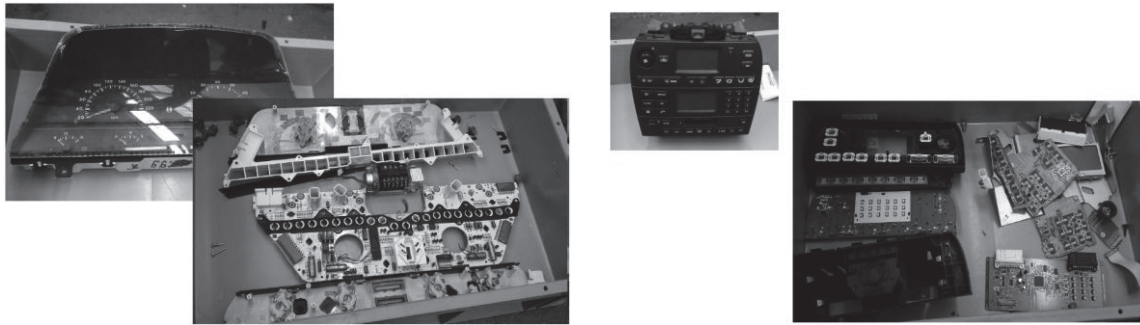


b. “Vehicle electronics” study

As part of the FOEN survey of the recovery potential of scarce technical metals (STM) from vehicle electronics, two separate partial studies were put in hand in the autumn of 2012. The vehicle recyclers supplied previously defined electronic components from their shelves; these were taken apart and analysed to determine the STM content.

The results will show whether it makes sense to dismantle electronic components ahead of the shredders and pass them on to the electronic scrap recycling facility for further processing. The other line of study concerns analysis of the output streams from the shredder plant. 103 vehicles were shredded. The result was intended to show the fractions in which STM occur. The analysis results will not be available until the first quarter of 2013.

This study is part of the “Environmental Research Concept for the years 2013-2016” presented by the FOEN. Attention will focus on such matters as energy and economic optimization of waste facilities as well as the optimum use and recycling of scarce metals including recovery from waste.

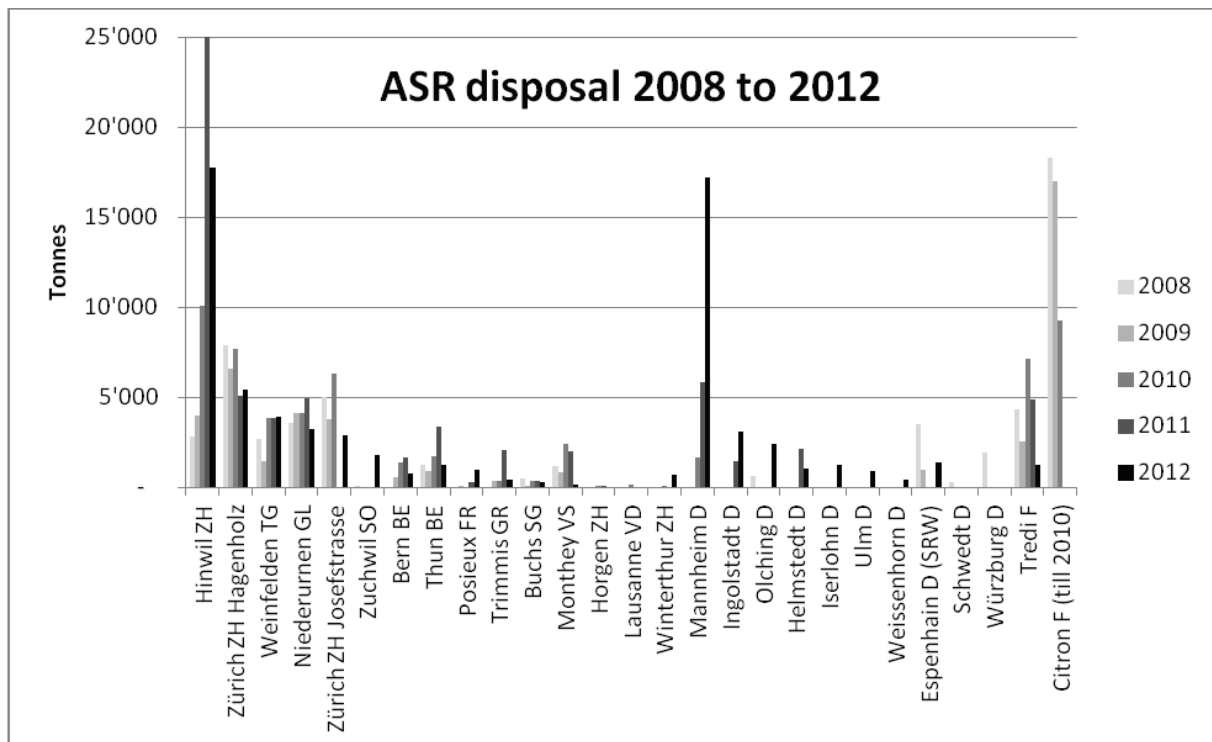


c. Recycling end-of-life vehicles and ASR

Some 100,000 vehicles have been recycled in Switzerland. This was 10 per cent more than in the previous year. 65,000 tonnes of iron and steel scrap and 7,000 tonnes of non-ferrous metals, primarily aluminium, were extracted from this refuse and returned to the material cycle.

The Foundation continued to pay a contribution of CHF 18.- per vehicle which finishes up in the shredder. This compensates for the higher recycling costs because of the de facto obligation to incinerate compared to the situation in neighbouring countries.

ASR recycling took place in 21 waste incineration plants (13 in Switzerland, 7 in Germany and 1 in France). The proportion which was recycled in Swiss facilities fell from 77 (2011) to 58 per cent. This reduction is explained by the incineration prices which came under severe pressure in Germany. German facilities have substantial spare capacities. Mechanical-biological waste treatment plants and substitute fuel power plants are major competitors. The average disposal costs for ASR including transport amount to CHF 198.- (previous year CHF 216.-).



d. Media relations

In a new edition of the INFO Newsletter, the Foundation reported on the use of raw materials from waste in general and on the recycling potential of automobile electronics in particular. In future, resources and energy will have to be recovered increasingly from waste.

A new and up-to-date presentation was adopted for the Foundation's website. The focus here is placed on the material cycle.

The Foundation decided to publish a new information brochure in the form of a folding sheet. This will be done in 2013.

3. Laws and regulations

a. Chemical Risk Reduction Ordinance (ORRChem)

As already mentioned in our last annual report, vehicle batteries have been covered by ORRChem since 1.1.2012. The result is that both starter batteries and the drive batteries of hybrid and electrical vehicles are subject to fees and compulsory notification. However, the battery and automobile branch has been released from the obligation to pay fees. auto-schweiz will notify the figures for batteries imported in new vehicles.

b. Technical Ordinance on Waste (TOW)

The FOEN completed its reorganisation by the end of the year. The waste industry recovered its previous importance as an independent department. This is intended to underline the importance of a resource and recycling economy. The path is now clear for completion of the TOW review. The draft ordinance is due to be published in the first quarter of 2014. The Foundation already announced its objections to the ASR chapter in May 2011. For the most part, they are being taken into account.

c. Electronic implementation aid for the movement of special waste and other controlled waste

The FOEN has worked intensively on the standardisation of the various implementation aids. For instance, the provision on the disposal of end-of-life vehicles dates back to August 2006. An electronic reference work has now been created which is useful for the implementing authorities and also for the source, transport and disposal operators who have to work with special waste and other controlled waste. The electronic implementation aid can be accessed via the FOEN website.

4. Events

- **Berlin Recycling and Raw Materials Conference**

This traditional event is more of a scientific nature. Many specialist papers originate from universities and their attached institutes. The subject of ways and means of recovering rare earths is still in its infancy and considerable research and development work will be needed to ensure efficient utilisation of the available resources. Conferences of this kind are also important to gain an overview of the various research programmes.

- **International Automobile Recycling Congress (IARC), Budapest**

The Foundation is a long-standing sponsor of this event. Federico Karrer, a member of the Foundation Board Committee, sits on the IARC Steering Committee. This year Dr Michel Monteil, FOEN Waste and Raw Materials Departmental Head, was the keynote speaker on the subject of resource efficiency and sustainable production and consumption. He also reported on the Swiss export regulations which have remained relatively simple and effective. The export of end-of-life vehicles has been and remains a controversial issue in Europe. Understandably, the recycling works would like to stem the practically unhindered outflow of old vehicles as this reduces the use of their own capacity; at the same time important raw materials are being lost.

- **EGARA Meeting, Lucerne**

EGARA is the European Association of Vehicle Recyclers. VASSO (the Swiss association) organised the annual meeting and invited the Foundation to present the situation of vehicle recycling in Switzerland. Prof. Christian Ludwig of the Paul Scherrer Institute in

Würenlingen summarised the considerations on the treatment of ASR in MWIP^{plus}, while Daniel Böni of the Zurich Oberland Refuse Recycling Facility (KEZO) added comments about the status of slag recycling as part of the ZAR project.

- VDI Conference “Material and energy recycling of shredder residues”, Nuremberg

This is the only conference which deals exclusively with the recycling of shredder residues. It benefits from information about electronic and plastics recycling. One noteworthy point is that there are several possible approaches to the efficient treatment of shredder residues. However, simple techniques are no longer sufficient to achieve the requisite recycling rates. Processing is relatively complex and therefore also expensive. The investment risk is increasing. The Foundation was able to illustrate the thermal treatment route which is being successfully followed in Switzerland.

- Federal Office of the Environment Workshop, Ittigen

As part of the Cleantech Masterplan, the FOEN has clarified the need for pilot and demonstration plants over a period of 5 to 15 years. The Foundation was invited to deal with the area of vehicle and ASR recycling. However, no need for special facilities is apparent at this stage. On the other hand, opportunities for dealing with electronic scrap and slag processing may be of interest to the Foundation.

- Conference of the Federation of Directors and Operators of Swiss Waste Treatment Plants (VBSA), Olten

The most important meeting of the Swiss waste industry focused on legislation, energy recovery from waste materials and the use of resources. Dr Michel Monteil, Head of the FOEN Department for Waste and Raw Materials, reported on the status of the TOW, OMW and ORDEA and discussed the outlook for the R'EFF project to implement the green economy project of the Federal Council in the years until 2050. For energy recovery, MWIP with heat decoupling play an important role. The fact is that after hydropower, MWIPs are the second largest producer of renewable energy because one-half of the waste is regarded as renewable.

5. Developments in other countries

The conferences referred to in the previous chapter all give an overview of activities in other countries. The fact emerges that Switzerland does not have the same legal bases as other European countries. The aim is the same: to protect human beings and nature against the harmful impacts of waste disposal and – increasingly important – ensure the efficient use of resources and the recovery of raw materials and energy at the end of the product life cycle. From 2015 a recycling rate of 95 per cent will apply to end-of-life vehicles in the EU of which a maximum of 10 per cent may be recycled for energy purposes.

There are three to four processing plants which in all probability will just meet the criteria. However, technical complexity is high and barely viable in economic terms. Except in The

Netherlands there is no financing system, i.e. the shredder works have to cover the full cost of disposal of residual materials. With stable and high metal prices the disposal costs can be covered - but what will happen if metal prices drop?

For some partial fractions, including old plastic materials, good recycling routes exist today. Finally, however, some residual material is always left behind and has to be disposed of. In other countries too not everything may now be dumped in landfill sites. Therefore the thermal treatment of partial fractions is rising, sometimes however in cement works instead of in refuse incineration plants.

Even without corresponding regulations, the quality of Swiss vehicle recycling is equivalent to that prevailing in the EU Member States and in most cases even better. Materials which do not lend themselves to ordinary recycling are passed on for thermal recycling with the appropriate subsequent treatment (see for instance slag processing). This enables possible negative impacts of high material recycling rates to be avoided.

6. Swiss vehicle statistics

With 328,139 new passenger cars sold (+2.9 per cent), the annual result was very good. Changes of ownership followed the same pattern with 820,096 previously used vehicles sold. At the end of 2012 more than 4.3 million Swiss passenger vehicles were on the road. The large number of new registrations was accompanied by a higher decommissioning rate. Just over half the vehicles were exported to 148 countries, of which 90,000 to Africa. The remaining 100,000 were recycled in Switzerland. Television broadcasts, e.g. about Benin, showed the demand for European vehicles. If necessary, they are repaired and then frequently driven for as many kilometres as they had on the clock when they reached the country concerned.

Statistics of passenger cars in Switzerland:

Year	New registrations (FEDRO)	Total on road (FSO/FEDRO)	Taken off road ¹⁾	Exports (CD)	Vehicles remaining in Switzerland	Value of vehicle exports CHF/veh.
2000	315,398	3,545,247	237,426	73,404	164,022	2,726
2001	317,126	3,629,713	232,660	83,319	149,341	2,643
2002	295,109	3,700,951	223,871	89,851	134,020	3,056
2003	271,541	3,753,890	218,602	94,682	123,920	2,812
2004	269,211	3,811,351	211,750	10,235	103,515	2,717
2005	259,426	3,864,994	205,783	90,354	115,429	3,160
2006	269,421	3,899,917	234,498	10,857	127,641	3,792
2007	284,674	4,002,584	182,007	13,695	50,312	4,064
2008	288,525	4,031,205	259,904	10,205	151,699	4,132
2009	266,018	4,051,832	245,391	82,967	162,424	4,113
2010	294,239	4,119,384	226,687	91,965	134,722	3,423
2011	318,958	4,209,672	228,670	96,430	132,240	2,776
2012	328,139	4,300,036	237,775	127,806	109,969	2,526

FEDRO: Federal Roads Office (status as of 30 September)

FSO: Federal Statistics Office (from 2008 FEDRO and no longer FSO)

CD: Customs Directorate (Foreign Trade Statistics)

¹⁾ Calculated: new registrations less increase in number on road

Exports of second-hand vehicles in 2012 (Source: Federal Foreign Statistics)

Country	Exports (EZV)	Value of vehicles CHF/veh.
Libya	50,695	1,123
Benin	12,979	1,166
Niger	12,463	1,051
Poland	8,846	1,522
Togo	5,663	987
France	5,579	7,164
Germany	5,176	13,355
Lithuania	3,822	3,462
Bulgaria	3,802	785
Nigeria	3,389	1,480
Cameroon	1,387	1,488
Turkmenistan	1,226	2,584
Czech Republic	869	3,645
Lebanon	689	2,180
...
Countries (total 148)	127,806	2,526

Annex

Documentation

Publications such as press releases, annual reports, INFO newspapers etc. can be consulted on the Foundation's website: www.stiftung-autorecycling.ch

Membership of the Foundation Board

Foundation Board President	Dr iur. Hermann Bürgi*
auto-schweiz	Christine Ungricht, Vice-President* Max Nötzli* Walter Frey Andreas Burgener Tobias Lukas
Automobile Club of Switzerland	Niklaus Zürcher
Motor Trade Association of Switzerland	Urs Wernli
Swiss Commercial Vehicles Association	Dr Michael Gehrken
Expert in motor vehicle disposal	Federico Karrer*
Environmental Protection Office, Canton of Aargau	Dr Peter Kuhn
Swiss Shredder Association	Dr Tobias Thommen
Touring Club of Switzerland	Christoph Erb*

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