DEVELOPMENT OF A GUIDANCE DOCUMENT ON “HOW TO PERFORM A SHREDDER CAMPAIGN”

PROPOSAL FOR A GUIDANCE DOCUMENT

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Guidance Document on How to perform a shredder campaign

1 PURPOSE OF A SHREDDER CAMPAIGN


Recital (8) of Commission Decision 2005/293/EC highlights the need of shredder campaigns to determine the output streams of a shredder related to end-of-life vehicles. Note 6 of that Commission Decision determines: “The output of end-of-life vehicle streams of a shredder shall be calculated on the basis of shredding campaigns in combination with the input of end-of-life vehicles to a shredder. The input of end-of-life vehicles to a shredder shall be calculated on the basis of weighing notes, receipts or other forms of bookkeeping. Member States shall report to the Commission on the number of shredder campaigns performed on their territory.”

2 PLANNING

Identification of partners involved in the shredder campaign is of high importance and should be done in a very early stage of the planning of the shredder campaign. There is for example an interconnection between the number and types of participating shredders and the number of ELVs to be shredded and statistical requirements might influence the choice of participating authorised treatment facilities (ATF).

A coordinator shall be determined who supervises the activities of the ATF and shredder and collects and evaluates the information from the participating institutions.
Supervision shall include

- Auditing during inspection and treatment of ELVs at the ATF
- Auditing during shredding is performed
- Check of data bases (ELVs, activity of ATF, mass balances of ATF and shredders)

The schedule of the shredder campaign is very much influenced by the number of participating ATF and shredders, the number of ELV to be treated and the time needed to acquire the ELV for the campaign. Recent shredder campaign in the MS took between 6 and 12 months time.

3 DETERMINATION OF THE ELV SAMPLE

In order to determine the sample of ELV to be treated in a shredder campaign, knowledge about arising of ELV must be available. Different approaches can be taken to get this information, e.g. (see also flow chart below)

i. The certificate of destruction (CoD), which shall describe the number of vehicles treated in ATF. Prerequisite for using the CoD-approach is that the number of issued CoD and the number of treated ELV match.

ii. Getting the information from the ATF via compulsory reports or questionnaires (the number of ELV treated is also part of the report of the Member State to the European Commission according to Commission Decision 2005/293/EC (Annex table 4)).

iii. Getting the information in an anonymous manner e.g. via an ATF-Association. This possibility should be evaluated if the approaches i to ii are not applicable. Like this the authorities get insight in the arising of ELVs and none of the individual ATF has to fear legal consequences. This approach can only be counted as an intermediate solution as the number of issued CoD and the number of arising ELV should coincide.

iv. Calculate the number of ELVs from the number of annually deregistered vehicles\(^1\) minus exported vehicles and vehicles temporarily stored on non-public ground. Prerequisite for using this information is that the exported and temporarily deregistered vehicles can be identified with sufficient accuracy. Sometimes tax authorities can be helpful sources for information.

v. Determine the delta in the registered fleet of the two consecutive years before the shredder campaign. In this approach information about exported and temporarily deregistered vehicles are crucial as well.

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\(^1\) Either explicitly de-registered vehicles or differences in the fleet between two years.
The number of ELV included in a shredder campaign is related to a number of factors.

**Accuracy** (Letter in the formula below: L)
The accuracy of the results of the shredder campaign is not determined in the monitoring requirements. It depends, inter alia, on the number of ELVs included in the shredder campaign. If a given accuracy (e.g. ±5% see complementary report “Background information”) cannot be achieved (for example because the number of ELV is too low in the shredder campaign due to budget restrictions), the achieved accuracy should be calculated and described in the report of the shredder campaign.

**Total number of ELV** (Letter in the formula below: N)
Approaches to determine the total number of ELVs in a MS are described at the beginning of this section.

**Average weight of a fraction resulting from shredding of a ELV** (Letter in the formula below: $X_1$) and **Variance of the weight of a fraction resulting from shredding of a ELV** (Letter in the formula below: $S_1$):
These factors are in fact results of the shredder campaign. In order to perform the required calculation results from previous shredder campaign might be applied. Due to very broad variances of the ELV weights in the recent shredder campaigns the resulting factor $S_1$ is very high. This results in a relatively high number of ELVs to be included in the shredder campaign to achieve a high
accuracy. Thus it is proposed to use results from shredder campaigns in the Member State for the determination of $S_1$. If such data are not available it is proposed to perform a shredder campaign, where shredding of ELVs is done in batches (e.g. 100 ELVs per batch) and document the output flows per batch. The results from those trials can be used as a basis for determination of $S_1$ in the next shredder campaign.

**Normal distribution quantile** (Letter in the formula below: $u$)
When the distribution of the observations is not known the test distribution of the variance of distribution is applied for normally distributed data. It is here the $t$-distribution. Due to the fact that the determination of the ELV number in the shredder campaign would be very complex and the difference between the results is usually small it is proposed to apply the normal distribution for the calculation. The value applied is 1.959964.

The formula to calculate the minimum number of ELVs in the shredder campaign ($m$) is as follows:

$$m = \left[ \frac{-L X_1 N + \sqrt{L^2 X_1^2 N^2 + 4u^2 S_1^2 N^2}}{2 u S_1} \right]^2$$

The result of the calculation shows the minimum number of ELVs to be included in the shredder campaign in order to achieve the required accuracy (RESULT A).

Shredders need a certain volume flow in order to be performed in normal operating conditions. That number differs between the shredders e.g. depending on the capacity of the shredders. A certain number of participating shredders is necessary in order to ensure that the campaign is representative for normal operation of all shredders over the year (see section 5 of this guidance document). By this a minimum number of ELVs is determined to be included in the shredder campaign (RESULT B). The higher number of ELVs from RESULT A and B shall be applied in the shredder campaign.
After having determined the number of vehicles to be included in the shredder campaign it has to be decided which vehicles are to be included. The composition of the vehicles determine the relation of the output streams from the shredder campaign. Numerous criteria influence the composition of a vehicle. Usually no data basis is available to describe the actual composition of the ELV fleet. In recent shredder campaigns auxiliary criteria to determine differences in the composition of the ELVs have been applied e.g. make & model, mass, fuel type, age and condition of the vehicles (see complementary report “Background information”).

An important element within the determination of the sample of ELVs is the differentiation between M1 and N1 vehicles. Due to their predominant purpose of transporting goods the composition of N1 vehicles and in particular N1 class III differs from those of M1 vehicles (higher shares of metal). Therefore the share of M1 and N1 in the overall number of ELV must be identified in any case when the ELV sample for the shredder campaign shall be determined.

The composition of some vehicles entering the AFT differs e.g. due to accidents (burned down vehicles), missing parts, additional parts or dirt and waste. Usually no data basis is available on the condition of ELVs in the MS when arriving at the ATF. Thus, expert judgement (e.g. enquiries of experiences of ATF) should be applied to decide whether the input of the shredder campaign must be adapted to those conditions.

Based on data on the metal content of vehicles (see complementary report “Background information”) it can be expected that there is no significant propor-
tion of the metal content. Those data suggest also that the significance of the relation between model and metal share is low. Data uncertainties exist due to the fact that a limited share of models is covered by the data.

With this background two (alternative) approaches are recommended:

a) Replicate the ELV fleet in the ELV sample based on the vehicles makes and models;

b) If this is not possible (e.g. due to difficulties to acquire the specific ELV in the shredder campaigns’ time frame) differentiate the sample of ELV in the shredder campaign as a minimum by the criterion M1/N1 vehicles and to use the M1-ELVs and the N1-ELVs on an “as received” basis. With the background of the data about the differences in the metal content of the vehicles (see the complementary document “Background information”) this approach seems to be justified.

4 ATF

The activity of the authorised treatment facilities (ATF) in the shredder campaign shall reflect the daily practice in the Member State. Evidence about practice of the ATF can be drawn from the reporting tables according to the annex to Decision 2005/293/EC respectively the reporting of the Member States to the European Commission.

If such evidence would not be applied (or is not available) the participating ATF must be chosen in a way that they are representative for the activity in the Member State. The resulting (high) number might conflict with budget restrictions for the shredder campaign.
If the "to do list" approach is taken the number of participating ATF is arbitrary.

Participating ATF need to be able to perform state of the art depollution (equipment available) and dismantling. Sufficient size to store dismantled and depolluted ELVs is important as well as availability of weighbridge / scales for ELVs, dismantled parts and parts / fluids from depollution (sometimes mobile scales are a solution in case of ATF without installed scales).

Incoming ELVs must be checked for missing parts. If parts are missing it should be considered whether this is an exceptional situation or represents usual ("representative") situation. Substitution of the part (from another ELV) for the campaign might be considered if parts are too often missing or if representativeness of the sample is endangered.

Weighing of the incoming ELVs at the ATF should be done after removal of possible waste or additional (non-representative) parts and replacement of missing parts (if realised).

Regarding the weight of the ELV Note 4 of the Annex to Commission Decision 2005/293/EC should be considered.

Identification of the ELV throughout the depollution and dismantling process shall be ensured (e.g. by spraying an ELV identification number on the car body).

Condition of the ELV, performed activities and weights must be documented. An example of a documentation sheet is shown in the Annex to this report.

All dismantled parts must be weighed. Accuracy of the scales shall be recorded in order to document reliability of the results of the shredder campaign. In case weighing of fluids is difficult (e.g. because the fluids are collected in an automatic system with tanks) filling level of tanks shall be checked before and after depollution of ELV which are included in the campaign.
Regarding the weight of the depolluted and dismantled ELVs Note 4 of the Annex to Commission Decision 2005/293/EC determines: “The weight of the depolluted and dismantled end-of-life vehicle (body shell) \( W_b \) shall be determined on the basis of information from the receiving treatment facility.” Anyhow, in the course of shredder campaigns individual weighing of the hulk (body shell) at the ATF facility is usually the preferable option in order to enable an overall input-output picture (weighing at shredder facilities is often done on a “per container basis” and not for each individual ELV).

All weights shall be documented in the protocol in order to prove accordance with the dismantling depth identified as “representative” practice in the MS.

5  SHREDDER

5.1  Choice of participating shredders

Different technologies exist for breakup of ELVs and installations show a broad range of size/capacity. The breakup process is combined with a variety of material separation steps. With this a variety of output streams may result from processing of ELVs.

In an early stage of planning a shredder campaign a comprehensive overview of the technologies applied for breakup of ELVs in the Member State shall be elaborated. It can be expected that shredding is by far the predominant technique\(^2\). Information can be available from the national associations representing shredder companies and/or from lists of installations permitted to treat ELVs.

Performance of shredders is influenced by operational settings (e.g. air flow rate), environmental conditions (e.g. humidity), the condition of the shredder (e.g. condition of the hammers in a hammer mill) and, if applicable, the effort (staff) to maintain a “sorting desk”. Currently no data are available which allow quantifying the effect of such factors on the performance of the shredders. Concluding, shredders must be selected for the shredder campaign in a way that their number reflects a representative picture of all active shredders in a Member State.

\(^2\) According to the quality reports only very few countries report a relevant amount of metal parts dismantled by ATF and directed to smelters without passing the shredder facilities.
The identification of the participating shredders shall be done according to the D’Hondt method based on the number of shredders in the Member State (for details see complementary report “Background information”).

In some cases it is not possible that the required number of shredders participate in the shredder campaign (e.g. due to budget restrictions or willingness of the shredder operators). In those cases the resulting effect for data accuracy shall be reported.

### 5.2 Setting system boundaries

System boundaries must be fixed for the shredder campaign. This is to be done based on the situation in the Member State in order to have a situation in the shredder campaign that reflects the daily practice in the Member State. Usually pre-treatment will be covered by the shredder campaign in order to get indication about the effects from pre-treatment on the composition of shredder input (see above). Decision must be taken regarding separation steps after the breakup process.

![System boundaries](image)

Figure 4: System boundaries

In almost all European shredders at least the fractions Fe, SLF and SHF are produced. Usually further separation into Fe, NFM, SLF and residual SHF is performed.
Setting of system boundaries shall be done in a way that the shredder campaign provides results which are representative for the daily practice of the whole of the shredders in the Member State.

When for example no further treatment of the SHF is performed in the Member State such treatment shall not be an element in the campaign. If all SLF is further treated in PST this should be included in the shredder campaign.

Participating shredders must have sufficient space to store dismantled and depolluted ELVs and weighbridge / scales for hulks and output fractions. The distances between participating installations will influence transport costs.

### 5.3 Shredding

The shredder and the storage areas shall be cleaned before and after the campaign in order to cover all materials.

The incoming ELV shall be stored in a specific area until sufficient material is available for stable operation conditions of the shredder. Which amount of material is necessary for stable operation conditions shall be identified together with the shredder operator.

In case irregular conditions occur, these shall be documented in the shredder protocol and considered in the course of the evaluation of the shredder campaign.

Weighing of the incoming hulks should (preferably) already be done at the ATF sites. Output fractions shall be weighed and all weights shall be documented in the protocol.

Transferability of the results of the shredder campaign to the overall situation in the Member State should be evaluated inter alia by checking the composition of the output streams. Standards and/or industry specifications for output fractions should be used as a basis for the evaluation where possible. For ferrous scrap
European Steel Scrap Specification and the ISRI Scrap Specifications\(^3\) have been mentioned as most important specifications (query in the year 2012). For other fractions no specifications seem to be applicable in a similar way.

### 6 DOCUMENTATION OF THE SHREDDER CAMPAIGN

The documentation of the shredder campaign shall be submitted together with the other explanatory documents to Eurostat, during the course of the yearly data submission and comprise, as a minimum, the following topics:

- Description of the ELVs included in the shredder campaign (number, composition of the sample, approach taken to determine number and composition of the ELV sample),
- Description of depollution and dismantling activities (approach to determine activities to be performed at the ATF, number of participating ATF and approach to identify/determine such ATF, dismantling performance and missing/additional parts),
- Mass balance of depollution, dismantling and shredding (and PST if included in the shredder campaign) including evaluation of the composition of the output fractions,
- Performed inspections,
- Evaluation of accuracy.

Partly it will not be possible to achieve highest data accuracy at all points. In the evaluation of the shredder campaign problems, deviations from planning and possible data inaccuracy shall be described. Key questions can be:

- Was the ELV sample in the shredder campaign representative for the whole ELV fleet (including condition of ELV)?
- Have depollution and dismantling been performed as planned?
- Did problems or irregular conditions occur during the shredder campaign?

An exemplary monitoring sheet for a shredder campaign can be found in the complementary report “Background information”.

### 7 FREQUENCY

\(^3\) Institute of scrap recycling industries
The need for performing shredder campaigns will be determined by development and/or implementation of new shredding and/or separation technologies and by changing composition of the ELV.

Regarding the breakup process of the shredders itself there is currently no breaking new technical development seen. New developments seem to develop regarding the treatment of the output fractions of the shredder (mainly SLF and residual SHF). Thus, the frequency of shredder campaigns must reflect the setting of system boundaries. When few separation steps are included (narrow system boundaries) a low frequency of shredder campaigns is justified and vice versa.

When system boundaries are set in a way that only the most common separation steps are included (resulting in the output fractions Fe, NFM, SLF, residual SHF after separation of NFM) a frequency of 4 years is appropriate to reflect possible changes in the composition of the ELV.