This project has been co-fundedwith the support of the LIFE financial instrument of the European Union [LIFE17 ENV/ES/000438]

lifecircelv@aimplas.es
www.lifecircelv.eu

CIRC-ELV
LIFE

BOOSTING CIRCULAR ECONOMY OF PLASTICS FROM END-OF-LIFE VEHICLES THROUGH RECYCLING INTO HIGH ADDED-VALUE APPLICATIONS

AIMPLAS TECHNOLOGICAL INSTITUTE OF PLASTICS
DESGUACE CORTES
indra AUTOMOBILE RECYCLING
ISOLAGO
SIGIT INDEPLAS SISTEMAS S.L.
SIGRAUTO

Contents

1 Description of the ELV treatment process and their plastics

Each year 10 million vehicles become end of life vehicles (ELVs) and are delivered to Authorized Treatment Facilities (ATFs) where they will be first depolluted, then some of their parts will be dismantled in order to prepare them for their reuse, and afterwards some other parts will be extracted from the ELVs in order to be sent to recycling processes. When the ATF has finished with its work, usually they will press the hulks to improve the transport efficiency and delivers them to a shredding facility. At the shredder the ELVs are shredded into pieces of around 10 cm of maximum length and then a separation process starts producing at least three fractions:

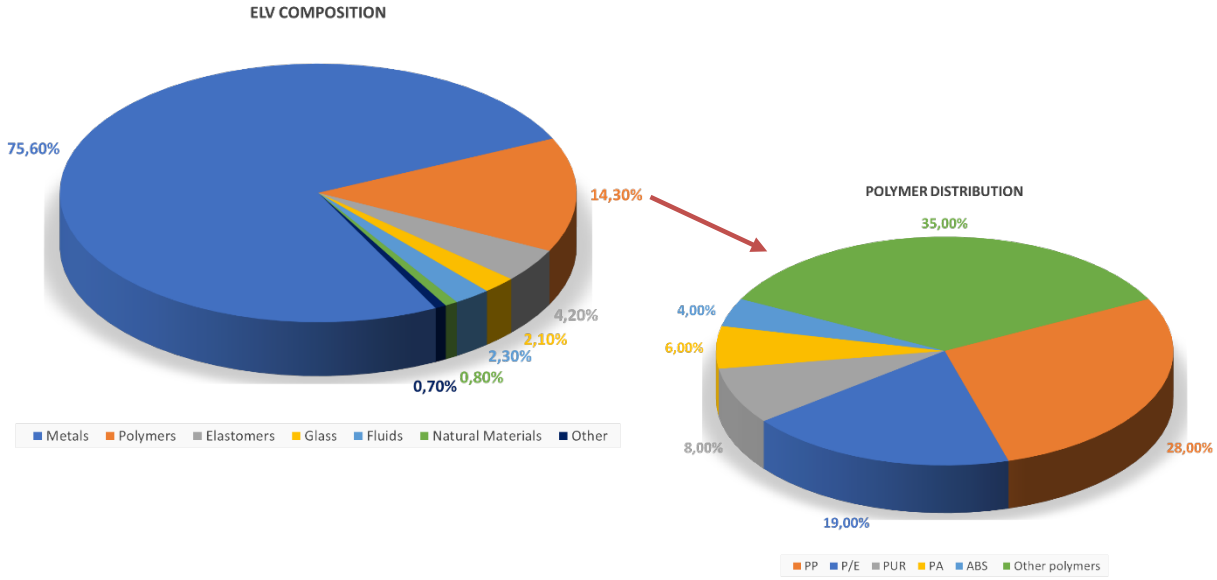
- Metallic scrap (both ferrous and non-ferrous)
- Shredder Light Fraction (SLF or *fluff*)
- Shredder Heavy Fraction (SHF)

Shredding plants directly send the metallic fraction to smelting/steel making industries and the remaining Automotive Shredder Residue (ASR) is processed at post-shredding facilities. Pot shredding facilities use all kind of separation and sorting techniques in order to obtain different materials that can either be recycled or energy recovered.

The 10 million ELVs contain around 1.5 million tons of plastics and as shown in the graph, around 50% are polyolefins (PP and PE)

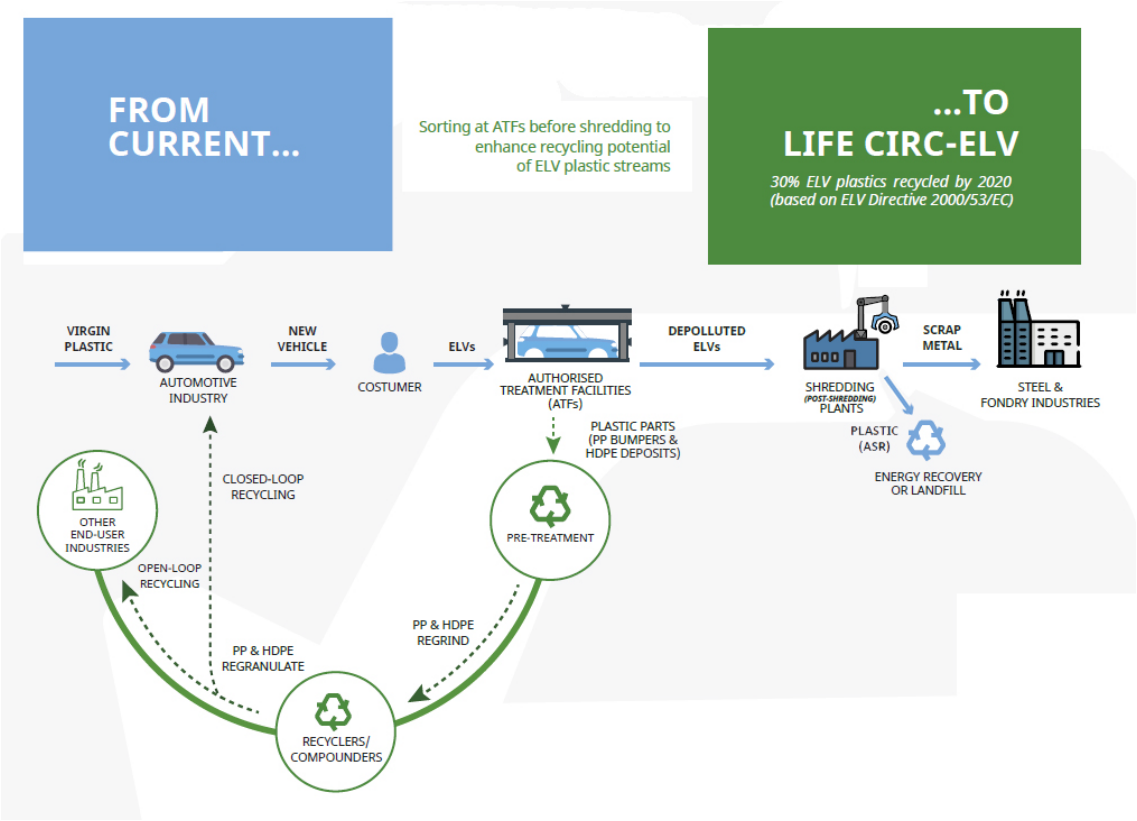
1 Description of the ELV treatment process and their plastics

Most of the plastics are left in the ELV hulk and the after shredding and post-shredding processes most of the plastic fraction is sent to energy recovery solutions, some plastic fractions are recycled and in some cases where there is not post-shredding processes or energy recovery solutions available, it is landfilled.



2 The LIFE CIRC-ELV model

The LIFE CIRC-ELV model consists in dismantling and sorting plastic bumpers and fuel tanks at the ATFs before delivering the ELVs to shredding plants. Pre-sorted plastics are then processed to obtain recycled plastics with suitable quality for their use in new market applications, either in automotive or other sectors (construction, electric and electronic equipment, etc.)



3 Partners and methodology followed

Every partner of the consortium had a very specific role and a great coordination work was needed in order to be able to fulfil with all the objectives and expected results.

Associated beneficiaries contact details:

DESGUACE CORTÉS
www.desguacecortes.es
Phone number: +34 962 737 392
Contact person:
Cristina Cortés
ccortes@desguacecortes.es

INDRA AUTOMOBYLE RECYCLING
www.indra.fr
Phone number: +33 047 427 34.00
Contact person:
Nicolas Paquet
n.paquet@resource-eng.fr

ISOLAGO
www.isolago.com
Phone number: +351 243 750 180
Contact person:
Helena Sousa helena.sousa@isolago.com

SIGIT AUTOMOTIVE
www.sigit.it
Phone number: +34 644 68 54 17
Contact person: Pablo Rodríguez
pablo.rodriguez@sigit.es

SIGRAUTO
www.sigrauto.com
Phone number: +34 91 703 01 01
Contact person: Manuel Kindelan
mkindelan@sigrauto.com

Coordinator beneficiary contact details:

AIMPLAS
www.aimplas.es
Phone number: +34 96 136 60 40
Contact person: dgpro@aimplas.es

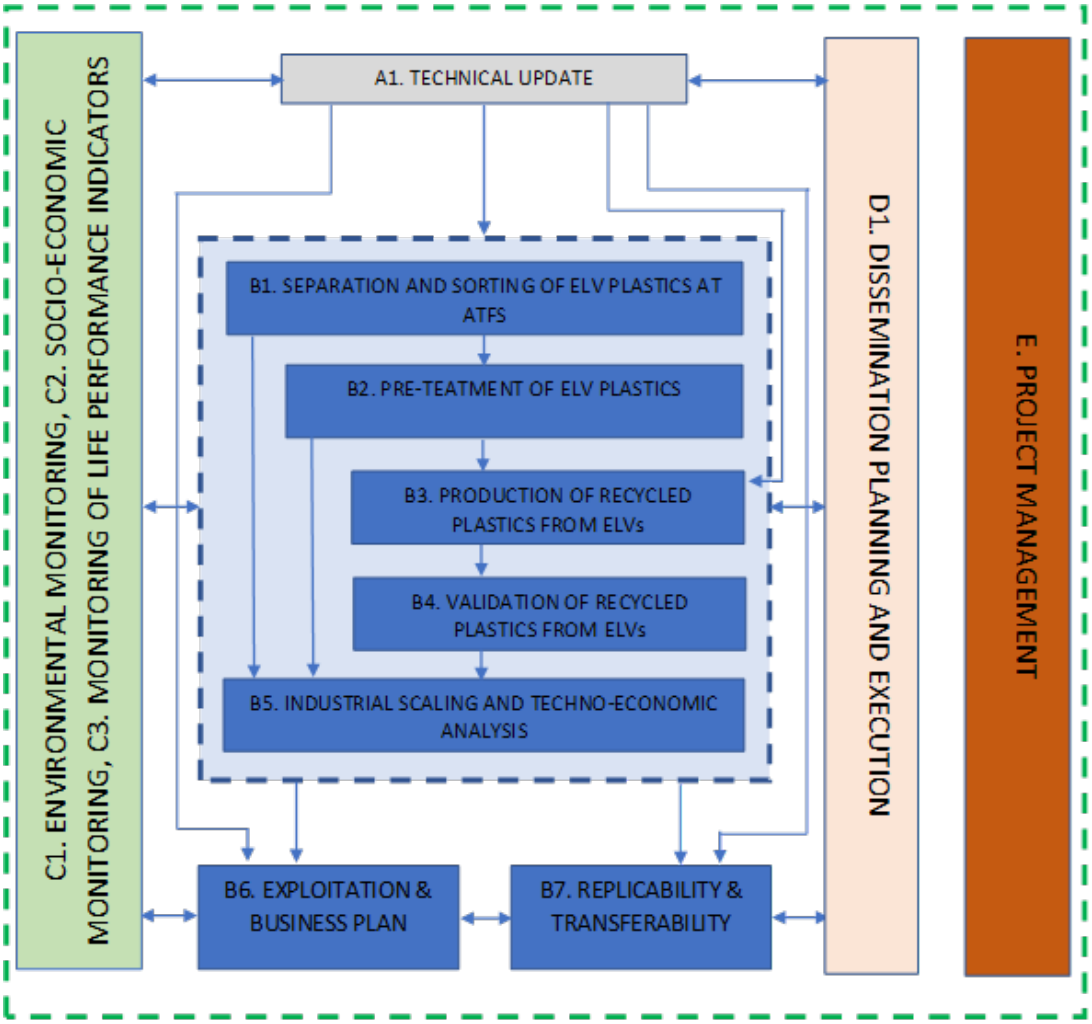
3 Partners and methodology followed

Every partner of the consortium had a very specific role and a great coordination work was needed in order to be able to fulfil with all the objectives and expected results.

- AIMPLAS as one of the most advanced Plastics Technological Centers in Europe has lead the project coordinating all activities but also has been involved in all the processes needed for preparing the plastics materials with their equipments and analysing their properties with its laboratory capacities.
- Desguaces Cortés is one of the most advanced ATFs in Spain and has been involved in all the actions aiming to find the best process for extracting and preparing the bumpers and fuel tanks from the ELVs.
- INDRA as one of the major players in the ELV recycling sector in France was crucial in providing and sharing all their expertise in order to find the best procedures to be applied for the extraction and preparation of the materials with Desguaces Cortés.
- ISOLAGO is one of the most advanced plastic compounders in Portugal and their role in the project was mainly to find the best compounding solution for the materials coming from ATFs in order to obtain a plastic compound that would comply with the technical and quality requirements that the automotive sector or the piping sector need.
- SIGIT is an automotive plastic part manufacturer based in Spain but that is part of an international group with an Italian core and their role was to demonstrate the feasibility of using recycled plastics coming from ELVs at competitive level in the automotive sector.
- SIGRAUTO is an association were vehicle manufacturers, ATFs and shredding and postshredding facilities are together in order to coordinate their activities in the implementation of the ELV regulation in Spain and has a close relationship with other similar entities all around Europe and its role in the project has been mainly in the dissemination and the external relationships in the replicability and transferability of the project.

3 Partners and methodology followed

The following scheme shows the methodology followed which was in most of the activities and iterative process where after finding out a problem at some point, the information is provided to the previous processes in order to find a solution until the problem is solved.



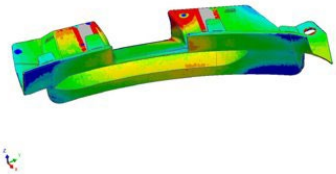
4 Results

More than 12 tones of recycled plastics were produced coming from 1.000 ELVs dismantled according to the new model. Desguaces Cortés implemented the LIFE CIRC-ELV model in their premises and will recover around 20.000 bumpers per year.

Pressing machine

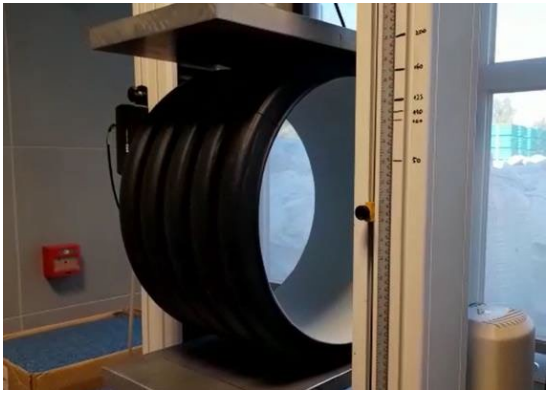
These recovered plastics were successfully recycled and used in fabricating new products. The properties of the recovered plastics were acceptable as recyclates, after they were sorted, shredded, cleaned and washed. However, to fulfil technical demand of automotive and construction plastic products, virgin plastics shall be used at the compounding step to have the final properties required by end users. The recycled plastics were used in the production of automotive parts and for pipes and fittings for the construction sector.

The automotive parts were validated by SIGIT and although the stability of the process has been demonstrated and 90% of the tests carried out comply with the requirements, material tests were found in the finished part that did not comply, so the next steps would be to review These tests with the OEM to achieve a derogation, if possible, repeat those tests that do not comply, or reformulate the material to change certain characteristics. More than 5,000 parts were produced with a 30% recycled plastic content.



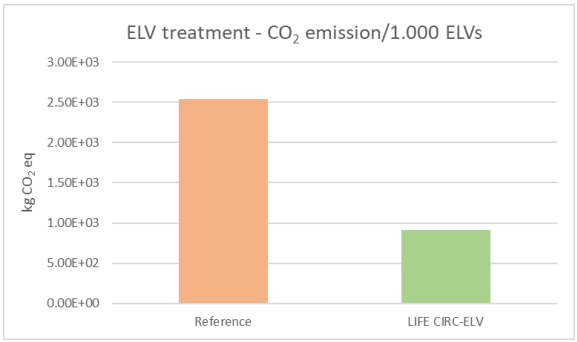
4 Results

Regarding Pipes and fittings, there were many trials carried out and finally after validating that the best was to use 25% of recycled plastics, 5941kg pipes and 2872 kg fittings that met the same requirements than the ones produced only with virgin materials.

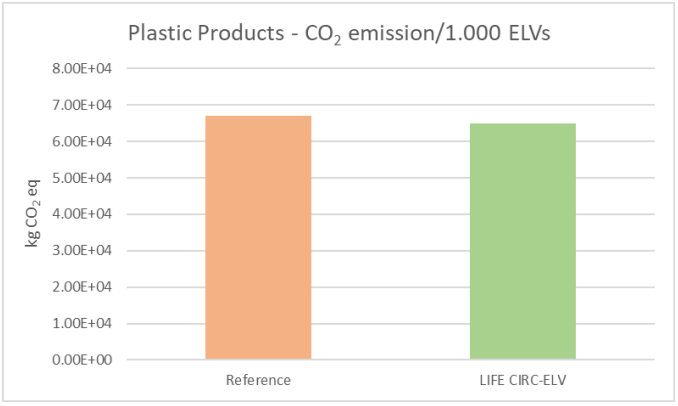


4 Results

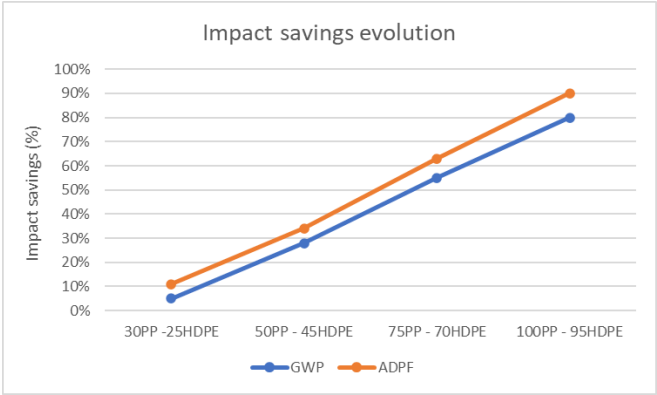
By implementing the new LIFE CIRC-ELV model at Desguace CORTÉS, the carbon footprint for the new model is reduced by 60 %.



The plastic recyclates obtained from this process, once they are pre-treated to be recycled, accounted for just 0.1 kg CO2eq/kg of plastic, compared to the values around 2 kg CO2eq per kilogram of virgin plastics. However, since the new materials need to be fabricated with a mixture of recyclates and virgin plastics, the overall emissions for the new products made of recycled plastic is not so high (just 10%).



Nonetheless, increasing the ratio of recyclated in the final products, could lead to a reduction in both CO2 emissions and energy consumption higher than 80%.



5 Transfering and replicating the LIFE CIRC-ELV model

One of the aims of the LIFE CIRC-ELV project is to be able to transfer the knowledge obtained during the project to other areas around Europe and also to look for the possibilities to replicate the model to other sectors. During the project several ATFs from different European countries and also different organizations dealing with ELV management and recycling have shown their interest in the project with the aim to implement the model at their facilities/countries.

The consortium has also looked for other sectors that could be interested in using similar recycled plastics in their production processes and have already found that there are some other sectors that have products using very similar plastics and they have even done some trials finding the recycled plastics very promising.

The LIFE CIRC-ELV partners at the different stages are in the disposition of offering consulting services to any ATF, compounder or part manufacturer in order to analyse which is the best way to implement the process at their facilities by looking at all the stages needed and providing not only technical guidelines for their process but also helping in finding the partners and providing them also with technical guidelines in order to have all the process covered.

6 Conclusions

The CIRC-ELV consortium believes that all the objectives and the expected results when starting the project have been achieved. Recycling plastics coming from ELVs by extracting them before the ELVs are sent to the shredding and post-shredding processes is viable from a technical, economic and specially environmental point of view. The model is affected by many different parameters being probably the most relevant the specifications and requirements of the final application but there are many other like the volumes needed, the plastic recycling and compounding infrastructure of the area, the labour and other related costs, the price of the recycled materials which is very much related to the virgin ones, etc.

During the project many lessons were learned that will help to boost circular economy of plastics from ELVs through recycling into high added-value applications.

If interested in knowing more about the project, we invite you to visit the project website and to see the videos that were produced during the project development: https://lifecircelv.eu/

This project has been co-fundedwith the support of the LIFE financial instrument of the European Union [LIFE17 ENV/ES/000438]

www.lifecircelv.eu

lifecircelv@aimplas.es