

INSIGHTS AND CLARIFICATIONS ON THE ASF TOOL

INTRODUCTION

PVC compounds contain additives that are necessary for processing and stability, and to modify the properties of the plastic.

The VinylPlus® Voluntary Commitment at European level includes a challenge to move towards sustainable use of additives.

The Additive Sustainability Footprint (ASF) has been developed to assess the sustainable use of additives throughout the life cycle of PVC articles.

The ASF addresses impacts in six life cycle assessment (LCA) steps established by ISO 14040, using the four system conditions (sustainability principles) developed by The Natural Step (TNS) covering social and environmental factors.

For each combination of life cycle stage and system condition, seven questions correspond to seven answers on the negative or positive contributions of the additive to the sustainability of the finished articles. The answers to the questions determine a score, which can be compared during each life cycle stage with that obtained by other additives.

Positive contributions also include service life, low maintenance, contribution to recyclability and the development of ethically acceptable solutions.

As a reference, the document available at the following link can be taken:

<https://4spepublications.onlinelibrary.wiley.com/doi/epdf/10.1002/vnl.21733>

THE REASONS OF THE ASF METHOD

Both risk and hazard approaches, based largely on intrinsic chemical attributes, fail to take into account, or address inconsistently, broader sustainability issues related to the sourcing, production and application of chemicals, their interaction with the products in which they may be used, and their fate at end-of-life or beyond. A more holistic approach to the use and management of chemicals throughout their life cycle, including from a societal perspective, is essential.

Life Cycle Assessment (LCA) measures some of these aspects of “sustainable chemistry”, using established environmental impact categories such as global warming potential, eutrophication, different aspects of ecotoxicity and ozone formation potential.

The integration of different risk criteria in an overall LCA is a further source of uncertainty. The lack of social considerations in conventional LCA has been recognized as a shortcoming.

The model developed is a scientific model through which to evaluate a system to verify its sustainability to photograph the current reality and develop strategic improvement programs.

For this reason 5 parameters have been defined on which to evaluate sustainable development for PVC:

1. Industry should make a long-term commitment to becoming “carbon neutral”
2. Industry should make a long-term commitment to a controlled PVC waste cycle system
3. Industry should make long-term efforts to ensure that releases of persistent organic compounds from across the life cycle do not lead to systemic increases in concentrations in nature
4. Industry should review the use of all additives in a manner consistent with achieving full sustainability and commit to phasing out long-term substances that may accumulate in nature or where there is reasonable doubt about toxic effects
5. The industry should commit to raising public awareness of sustainable development across the sector and to include all stakeholders in its achievement

Once the reference parameters for the evaluation of sustainable development were defined, a method called Additive Sustainability Footprint (ASF) was developed to evaluate the socially sustainable use of additives in the life cycle of PVC articles.

Below is described how, using the ASF tool, the sustainable use of additives throughout the entire social life cycle of PVC articles can be evaluated.

HOW ASF WAS BORN

The development of ASF for PVC began with the recognition of four factors:

1. The European vinyl industry was already making significant investments related to sustainable development aspects through initiatives such as REACH registration files, LCA, EPD and Product Environmental Footprints (PEF);
2. These initiatives do not take into account the roles and behaviours of additives as functional constituents of complex products, some (e.g. REACH) address intrinsic chemical properties treated in isolation, while others (e.g. LCA, EPD and PEF) focus on the environmental impacts of production and, in some cases, other life cycle stages;
3. None of these initiatives take into account a broader systemic context of sustainability;
4. No account is taken of the positive benefits resulting from the functional contributions of additives that enable articles to meet human needs on a potentially sustainable basis, or at least on a more sustainable basis than competing materials or if additives had been omitted from the PVC matrix. For example, they may contribute to product durability (longer service life per unit of chemical and energy input), to the reduction of maintenance inputs during the life cycle compared to alternatives, to make the product recyclable within the PVC material, to contribute to a controlled production cycle management and/or to reductions in virgin raw material inputs.

Nasce inoltre sulla base delle seguenti “TNS Sustainability Conditions”:

1. **No increase in “concentrations of substances extracted from the Earth’s crust” (TNS SC1).** Human activities can liberate into ecosystems substances sequestered over geological time in the lithosphere

- a) Scarce metals, minerals, and fossil carbon must not be released to nature at a rate exceeding natural reassimilation, requiring phase-out or recapture in controlled loops of scarce mined materials;
- b) Sources of raw materials (including energy) must be renewable, or the resources must be fully recycled, avoiding fossil carbon or other emissions

2. No increase in “concentrations of substances produced by society” (TNS SC2).

Substances manufactured by society and novel to nature, or modified into forms alien to ecosystems, must not be released beyond natural breakdown and reassimilation rates

- a. Raw materials used for additive production must be fully degradable unless managed in controlled-loop systems or incorporated into articles, which can be recycled
- b. Additive components that are able to migrate must be fully degradable unless managed in controlled-loop system
- c. Across product life cycles, emissions, or discharges resulting from production/use of additive systems must be minimized as a resource conservation measure but, where unavoidable, should comprise fully degradable substances;
- d. Controlled-loop systems and recycling processes must themselves avoid pollution and be optimized to retain the highest resource potential

3. No “degradation by physical means” (TNS SC3). Physical degradation results when living or non-living elements of ecosystems and their processes (water, land, and other resource use including ecosystem disturbance) are exploited beyond renewable limits

- a. Sourcing of raw materials used for production of additives must come from well-managed ecosystems, and spent materials beyond end-of-life must not physically degrade ecosystems

4. People are not subject to structural obstacles to health, influence, competence, impartiality, and meaning (TNS SC4). Actions or policies that undermine the ability of people to meet their needs, including health and safety; basic rights; skills and knowledge; equity [resource efficiency / depletion]; and well-being/meaning

- a. PVC products including their additives must not lead to negative impacts on the wellbeing of humans or the environment;
- b. Additives must be produced and managed under responsible and ethical practices;
- c. Additives enable reliable technical performance to deliver functionality supporting diverse human needs; and
- d. Additives must not restrict the capacity for efficient management of resources through mechanical and feedstock recycling either by:
 - i. reduction in the quality and quantity of the recyclate; or
 - ii. preventing mixing of PVC from multiple end-of-life and postindustrial products in recycling streams (compatibility)

In summary, the “Sustainability Conditions” taken as a reference by the ASF method can be summarized as in the following table:

System Conditions for a sustainable society	Related topics	Success criteria for the sustainable use of additives
 <p>1. Substances from the Earth's crust must not systematically increase in concentration in nature.</p>	<ul style="list-style-type: none"> Metals & minerals Energy Renewable / recycled materials 	<ul style="list-style-type: none"> Scarce metals, minerals and fossil carbon must not be released to nature at a rate that exceeds the rate of re-assimilation. This implies the phase-out, or the recapture in controlled loops, of scarce mined materials. The energy sources must be renewable. The sources of raw materials must be renewable, or the resources must be fully recycled.
 <p>2. Substances produced by society must not systematically increase in concentration in nature</p>	<ul style="list-style-type: none"> Circular flows (bio-degradability / technical loops) Efficient production Benign emissions 	<ul style="list-style-type: none"> Raw materials used for production of additive components must be degradable unless managed in controlled-loop systems or incorporated into articles which can be recycled. Additive components that are able to migrate must be degradable unless managed in controlled-loop systems. Across product life cycles, emissions or discharges resulting from the production/use of additive systems must be kept to a minimum as a resource conservation measure but, where unavoidable, should only comprise degradable substances. Controlled-loop systems and recycling processes must themselves avoid pollution and must also be optimized to retain the highest resource potential.
 <p>3. Nature must not be systematically degraded by physical means.</p>	<ul style="list-style-type: none"> Water use Resource use Land use Ecosystem disturbance 	<ul style="list-style-type: none"> Sourcing of raw materials used for production of additives must come from well-managed ecosystems.
 <p>4. People must not be subject to structural obstacles to health, influence, competence, impartiality and meaning.</p>	<ul style="list-style-type: none"> Health & safety Basic rights Skills and knowledge Equity (resource efficiency / depletion) Well-being / meaning 	<ul style="list-style-type: none"> The additives enable reliable technical performance to deliver functionality that helps to support diverse human needs. PVC products including their additives must not lead to negative impacts on the wellbeing of humans or the environment. The additives must not restrict the capacity for efficient management of resources through mechanical & feedstock recycling either by: <ul style="list-style-type: none"> reduction in the quality and quantity of the recycle preventing the mixing of PVC from multiple end-of-life and post-industrial products in recycling streams (compatibility)

Of course, the 4 principles listed above also include the 17 EU Sustainability Goals that must be respected by a producer of additives for plastics such as PVC for example.

STRUCTURE OF THE ASF TOOL

At the heart of the ASF tool is a matrix that orients each of the TNS system conditions to the six phases of the ISO14040 life cycle:

TNS System Conditions	LCA life cycle stages as relevant to the sustainable use of PVC additives					
	Raw materials	Additive production	Packaging and distribution	PVC compounding / converting	Product use	Product fate
SC1 (Earth's crust)	Impact questions Progress questions	Impact questions Progress questions	Impact questions Progress questions	Impact questions Progress questions	Impact questions Progress questions	Impact questions Progress questions
SC2 (Man-made substances)	Impact questions Progress questions	Impact questions Progress questions	Impact questions Progress questions	Impact questions Progress questions	Impact questions Progress questions	Impact questions Progress questions
SC3 (Physical degradation)	Impact questions Progress questions	Impact questions Progress questions	Impact questions Progress questions	Impact questions Progress questions	Impact questions Progress questions	Impact questions Progress questions
SC4 (Human needs)	Impact questions Progress questions	Impact questions Progress questions	Impact questions Progress questions	Impact questions Progress questions	Impact questions Progress questions	Impact questions Progress questions

For each substance under assessment and for each of the LCA stages/TNS conditions combinations (24 cells) 7 questions are asked requiring 168 answers.

The questions are divided into two blocks:

- impact questions: make a comparison with TNS System Conditions

- progress questions: commitments that can be made to achieve a positive comparison with the TNS System Conditions (including resource efficiency, responsible sourcing and closing knowledge gaps)

As an example, the questions that are asked for the first block [Raw materials / SC1 (earth crust)] are shown below:

	Impact questions
1.1.1	Are the raw materials free from metals, minerals and hydrocarbons that risk accumulating in nature (e.g. due to scarcity in nature such as with Cu, Ag, Sn, Cd, Hg, etc. or due dispersed use / disposal)?
1.1.2	Are the raw materials sourced in ways that avoid release of substances from the earth's crust that can accumulate in nature? (i.e. during virgin extraction, sourcing of natural resources and/or recycled or reused materials etc.)?
1.1.3	Are all raw materials extracted, processed and transported using renewable energy sources?
	Progress questions
1.1.4	Are there targets and actions being taken to phase out use of metals, minerals and hydrocarbons that risk accumulating in nature (i.e. through product development, R&D, switching to bio-alternatives etc)?
1.1.5	Are there targets and actions being taken to improve resource efficiency and achieve zero waste/emissions of metals / minerals / hydrocarbons in supply chain? (e.g improved processes, switching to materials with lower sourcing impacts etc.).
1.1.6	Are there targets and actions being taken to source raw materials from suppliers using renewable energy?
1.1.7	Are raw materials sourced in accordance with a responsible sourcing policy that addresses the risk of metals, minerals and hydrocarbons accumulating in nature?

The answers include three elements:

- (1) overall response (“YES”, “NO”, “Non applicable” or “Do not know”);
- (2) assessment of confidence level (“HIGH” o “LOW”); and
- (3) comments/references documenting supporting evidence or reasoned justification for answers provided.

The ASF outputs (responses) to the above questions are generally presented in color but scaled from red to green as shown in the figure below

7 yes / NA	Very Good	All answers positive. System Condition is met.
6 yes / NA		Mostly positive responses. System Condition mostly met.
5 yes / NA	Good	Mostly positive responses. System Condition mostly met.
4 yes / NA		Some positive responses. System Condition on the way to being met.
3 yes / NA		Quite a few negative responses.
2 yes / NA	Bad	Mostly negative responses. System Condition mostly not met.
1 yes / NA		Mostly negative responses. System Condition mostly not met.
0 yes / NA	Very bad	All answers negative. System Condition not met.

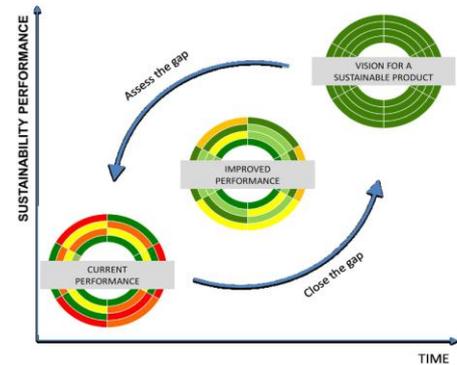
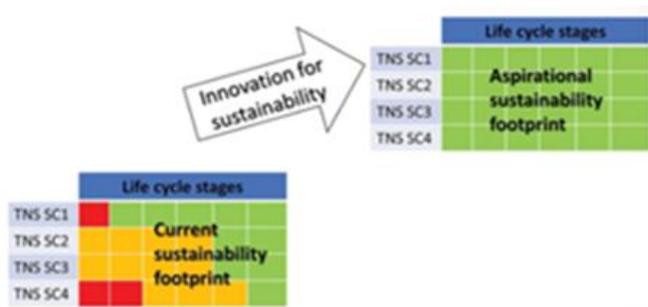
WHO CAN BENEFIT FROM THE ASF TOOL

ASF can serve many needs and many users as:

- 1) Additive manufacturers may wish to conduct an ASF to assess, innovate and subsequently demonstrate to customers and regulators the sustainability benefits of the use of their specific additive substance.
- 2) Trade associations covering generic additive types (e.g. stabilizers or plasticizers) may wish to raise awareness of strengths and also of problems requiring innovation, including supporting dialogue with regulators and policymakers particularly where positive contributions to meeting human needs have not been strongly communicated in the past.
- 3) Trade associations addressing converted PVC applications (such as pipes, window profiles or flooring) may also conduct ASFs to serve similar purposes.
- 4) At individual company level, ASFs may serve valuable awareness, risk assessment, innovation, and communication purposes relating to the sustainability virtues and challenges of specific products.

Documented assessment of the use of alternative additives, new additive substances, different additive manufacturing processes or alternative suppliers or geopolitical regions, or whether suppliers can fill knowledge gaps, including providing evidence of product stewardship, can help improve the overall ASF score by improving the article's contribution to meeting human needs or overcoming negative impacts. These requirements can be communicated, in transparent way, along supply chains for suppliers taking into account "hotspots" of sustainability concern, enabling more sustainable use of additives in PVC article life cycles.

Below it is illustrated the potential of the ASF tool for the development of an innovative strategy leading towards a vision of sustainable use of additives:



All these benefits of ASF assessment developed for PVC, can potentially extend to other materials. and can also be useful to inform and demonstrate the achievement of wider societal goals, including resource efficiency aspirations, emissions regulation, for example under the EU REACH process, and industry obligations in addressing climate change.

In addition, ASF can provide scientifically justified evidence to support the long-term resolution of the inherent conflicts between these EC strategies, demonstrating the value of end-of-life recovery and reuse of PVC.

ASF assessment can also contribute to the issues identified in both the European Commission Strategy towards a non-toxic environment and the Circular Economy: Implementing the Commission's Circular Economy Action Plan.

CONCLUSION

- ASF is a replicable, risk-based approach that integrates TNS' comprehensive and scientifically based sustainability principles (system conditions) across the entire social life cycle of PVC articles to assess the sustainable use of PVC additives.
- ASF integrates different types of quantitative and qualitative knowledge (including environmental, ethical and process management), building on previous investments as “pieces of a puzzle” that contribute, with additional assessments, to the evaluation of a broader spectrum of socio-ecological dimensions of sustainability.
- ASF addresses issues at each stage of the life cycle through a set of three “impact questions” and four “progress questions”, taking into account knowledge or data gaps, as a stimulus for innovation by converters, resin producers and additive suppliers to make transparent progress towards sustainable development.
- Sensitivity assessment based on the comparison of two different additives and their supply chains, as well as recycled versus virgin PVC, demonstrates the value of ASF in differentiating the sustainability profiles of alternative formulations.
- The ASF method is clearly to be included among the tools available for developing a true Ecodesign of products as it involves the entire process of conception, design, and disposal/reuse of a product in a way that respects the environment and people.

As a final conclusion, it is worth underlining that the ASF tool is not only a tool to evaluate and improve the sustainability of PVC, but since it is based on general concepts of sustainability, it can be adopted for all additives used in all materials (plastic and non-plastic).

Annex 1: POTENTIAL SUSTAINABILITY ISSUES IN THE USE OF ADDITIVES

Below is an analysis of the potential sustainability issues investigated by the TNS System Conditions associated with the use of metal stabilizing additives in PVC, including potential

positive consequences



negative consequences



mitigation measures at specific points in product life cycle



Life-cycle stages					
Raw materials acquisition	Additive production	Packaging and distribution	Compounding and/or converting	Product use and/or maintenance	Post-use management
<i>TNS System Condition 1</i>					
⊖ Risk of persistent heavy metals released in mining	⊖ Risk of metal release in manufacturing	⊖ Risk of metal release in transport	⊖ Risk of metal release in compounding	Risk not perceived as metals are immobile in PVC compound	⊖ Risk of metal release in incautious disposal
⊕ Cadmium or lead are both now phased out from manufacturing in Europe by voluntary commitment	↑ Controlled manufacturing with postindustrial waste recycling or safe disposal	↑ Tightly controlled transport	↑ Controlled compounding with postindustrial waste recycling or safe disposal		⊕ Controlled-loop recycling means metals are contained for reuse
↑ Cease procurement from additive suppliers not signing up to European voluntary standards					
↑ Substitute with lighter elements more abundant in nature, or derive from recycled metals					
<i>TNS System Condition 2</i>					
⊖ Risks from exhaust fumes and oils during extraction	⊖ Risks from exhausts or other emissions in manufacturing	⊖ Emissions in transport	⊖ Risks from emissions during compounding	⊕ The resilience of stabilized PVC gives long service life with low maintenance, averting inputs during extended service life	⊖ Risk of emissions in incautious disposal
↑ Use low-emission machinery that is well maintained	↑ Low-emission manufacturing with postindustrial waste recycling	↑ Tightly controlled transport to minimize risk	↑ Use low-emission machinery that is well maintained, with postindustrial waste recycled or safely disposed		⊕ Controlled-loop recycling means emissions and material value are contained
<i>TNS System Condition 3</i>					
⊖ Risks habitat loss and groundwater disturbance during extraction	⊖ Habitat displacement by manufacturing operations, and risks to water systems	⊖ Physical disruptions from transport	⊖ Habitat displacement by compounding operations, and risks to water systems	⊕ The resilience of stabilized PVC gives long service life with low maintenance, averting management activities and inputs damaging to nature (including reduced water use) during extended service life	⊖ Risk of emissions in incautious disposal physically damaging ecosystems
↑ Ideally, switch to recycled metal sources avoiding physical impacts	↑ Seek water- and biodiversity-neutral design of plant and management systems	↑ Tightly controlled transport with full loads to minimize risks	↑ Seek water- and biodiversity-neutral design of plant and management systems		⊕ Controlled-loop recycling means material value is contained and landfill is not required
↑ For virgin metals, switch to suppliers certified for best mining practice		↑ Select packaging that will not be landfilled	↑ Ensure that waste is diverted from landfill		
<i>TNS System Condition 4</i>					
⊖ Potential health risks during extraction	⊖ Potential health risks during manufacturing	⊖ Potential health risks during transport	⊖ Potential health risks during compounding	⊕ The resilience of stabilized PVC gives long service life with low maintenance, supporting the meeting of diverse human needs during extended service life	⊖ Health risks through incautious disposal
↑ Ensure that suppliers are audited for low-emission machinery and safe and ethical operating practices	↑ Ensure that manufacturing uses safe and well-maintained machinery with safe and ethical operating practices	↑ Ensure that transport uses safe and well-maintained machinery with safe and ethical operating practices	↑ Ensure that compounding uses safe and well-maintained machinery with safe and ethical operating practices		⊕ Waste of material value through incautious disposal
					⊕ Controlled-loop recycling means material value are contained and safety is ensured
					⊕ Controlled-loop recycling also creates new employment opportunities

ANNEX 2: AN EXAMPLE OF ASF APPLICATION (ELECTRIC CABLE SECTOR)

ASF is like having a medical check-up: If you do it, you may not be happy with the outcome, but if you don't, you could live peacefully... but only for a few months; then you will have to do it or stop producing.

Below is an example of the ASF methodology applied over the years to the PVC electrical cable sector. The evolution of cables towards increasingly sustainable formulations is highlighted.

The following figures show the formulations of several years ago compared with those possible today where we see an almost total change in the additives used, a change resulting also from the use of the ASF tool.

You can see how substances such as DEHP, MCCP, ATO, Zinc Borate and Pb stabilizers can be and have been eliminated and replaced with other non-classified substances:

PVC Insulation	phr	PVC Insulation	phr
PVC S K70	100,0	PVC S K70	100,0
DEHP	36,0	DIDP (o bio-plastificante)	44,0
CaCO ₃	50,0	CaCO ₃	15,0
Calcined Clay	10,0	Calcined Clay	10,0
MCCP	12,0	MDH	35,0
ATO	4,0	ATO-Free Flame Retardant	10,0
Zinc Borate	2,0		
Lead Stabiliser	4,0	RPK B-CV/3038	4,0
Lubricants	x	Lubricants	X
Pigments	x	Pigments	X

<p><u>Stabilizzante al Pb (SVHC)</u> DOP (SVHC) ATO = H351, H373 Zn Borate = H361-d, H341 MCCP = H362</p>	<p><u>Stabilizzante CaZn – not Classified</u> LMW Phthalate (DIDP) - o in futuro, bio-based ATO-free FR = not Classified</p>
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By applying the ASF method colour scheme, the following table was obtained for the new PVC of electrical cables, which highlights that the sustainability conditions could and can be achieved for practically all phases.

PVC "new"	RAW MATERIALS	ADDITIVE PRODUCTION	PACKAGING & DISTRIBUTION	COMPOUNDING & CONVERTING	ARTICLE USE	ARTICLE FATE
EXTRACTION						
NEW CHEMICALS						
EROSION						
PEOPLE						

Therefore, for cables that are subjected to ASF assessment and designed according to the resulting indications it can be concluded that:



PVC cables are mechanically recyclable and have only 43% C-H

Additives that can be used in PVC cable sheaths may not be classified or may show a classification level of no concern; all can be assessed according to the ASF methodology

The mechanical recyclability of PVC allows for enormous savings in raw materials and energy

PVC cables evaluated with the ASF method prove to be a very sustainable application

ANNEX 3: THE IMPACT OF USING THE ASF TOOL ON CIRCULARITY AND SUSTAINABILITY

By reading this document, it is possible to understand how the use of the ASF methodology can produce products that are increasingly sustainable, without having negative impacts on nature, health and climate change, but rather contributing to their preservation.

PVC is a plastic material that has the following important and specific characteristics:

- 1) It contains only 43% carbon atoms
- 2) Through a correct use of additives, it can be used to produce different types of products:
 - a. Rigid or flexible,
 - b. short-lived (e.g. packaging for pharmaceutical or food products) or long-lived - durable (e.g. windows, pipes, flooring, cables)
- 3) It is a polymer that is intrinsically mechanically recyclable at the end of its life even up to 10 times. Let's take, for example, a PVC window that normally has a life in use of at least 30 years, and let's do the calculation on a kg of PVC used to produce that window today. If at the end of its life we recover the window and use it as recycled to produce other windows, the kg of PVC used today will have a minimum durability of $30 \text{ years} \times 10 \text{ recycles} = 300 \text{ years}$ of use.
- 4) From an analysis carried out on various types of PVC products it has been assessed that the reuse of post-consumer PVC allows a reduction in CO₂ emissions into the air equal to an average of 2 tons/ton of recycled PVC.

Apart from the first characteristic, the other characteristics listed above are influenced by the type of additive used. From here we can say that durability and recyclability are also dependent on the type of formulation adopted. Therefore, the use of the ASF method is a tool that influences the sustainability and circularity characteristics of the PVC product.

- a) Let's start from circularity

As anticipated, PVC is a highly mechanically recyclable material and can be used both as waste and as MPS, (depending on the type of treatment it has undergone to be recycled) both in the same application sector (to produce the same product) or other types of products compatible with the formulation of the recycled material. But the factor that could limit the exploitation of PVC's recyclability is the type of additives present.

Let's take durable products as a reference. Many of the waste collected today were produced from 10 to over 50 years ago, in the absence of Reach and subject to other regulations that were less stringent at the time, which allowed the presence of substances that are now restricted in the product. This reduces the ability of the PVC product to be recycled, thus decreasing the circularity of the product itself. Hence the importance of applying the ASF method, which allows us to evaluate the characteristics of the substances used even in the future (danger and risk) in order to guarantee the complete mechanical recyclability of the end-of-life collected even in many decades.

An example is that of the cables illustrated previously:

- The old formulation adopted years ago contained some substances that are now restricted (Pb, DEHP) or in the process of being restricted (MCCP and others). The presence of these substances, which are called "Legacy Additives" are increasingly limiting the recyclability of cables, so much so that the PVC cable industry itself is developing an industrial technology to separate the end-of-life that does not contain Legacy Additives (to be sent for direct recycling) from those that do contain them (to be sent to landfill or to a hypothetical chemical recycling, which would still involve high energy costs).

- The new formulation does not contain Legacy Additives or possible future Legacy Additives; therefore, it essentially guarantees almost 100% recyclability of the collected end-of-life. In this way, the maximum circularity value can be obtained.

b) Let's continue with sustainability

The possibility of recycling the PVC product at the end of its life has an impact on the sustainability of the product through:

- Lower consumption of virgin raw materials with a positive impact on the first 3 TNS Conditions (SC1, SC2, SC3)
- Lower CO2 eq emissions (2 tons CO2/Ton of recycled PVC)

At the same time, through ASF, greenhouse gas emissions due to the production of individual additives and the operating conditions of the production of the product linked to the presence of the different individual additives are compared.

Therefore, through ASF, a comparison can also be made between two substances not considered dangerous (no Legacy Additives) to choose the most sustainable solution. This result will influence the sustainability performance (graphically represented by the color: green, yellow, red) that will be inserted in the individual blocks of the TNS System Conditions and Life Cycle Stages matrix; as already highlighted in annex 2 for the analysis done for the cable sector.