Charter for a *Responsible Use of PVC*™ and chlorine management

This charter aims to promote the responsible management of both chlorine and PVC. Chlorine is a by-product of the production of sodium and potassium hydroxide and a key ingredient in PVC. Since the production of these caustic products and PVC are inextricably linked, any management strategy for chlorine must also address the use of sodium and potassium hydroxide. The goal of this charter is for PVC to be produced using the best available technology and used only for goods designed with safe materials and a manageable post-use recycling chain in place

PVC is considered responsibly used provided that the following conditions are fulfilled:

- **Safe PVC production:** Vinyl chloride isn't produced with chlorine originating from mercury- or asbestos diaphragm based chloralkali processes. The residual Vinyl Chloride Monomer (VCM) content is very low.
- **Safe additives:** Heat stabilizing systems are optimized for safety and don't rely on toxic heavy metals. When plasticizers are needed, alternatives with much better safety profiles are utilized instead of ortho-phthalates.
- **Applications:** PVC is used exclusively for applications in the construction sector like pipes, tubes, doors, window frames, flooring. These products are indeed best suited for manageability after use because they are immobile during the use phase and used in large quantities per functional unit. This makes them traceable and retrievable during building renovation and demolition.
- **Take-back system and recycling:** Effective commercial take-back systems are offered after use and recycling concepts maintain the integrity of the PVC molecule.
- **Commitment and innovation:** The organization aims to reduce the need for primary PVC production and therefore is also reviewing its processes and commercial relationships for supporting and phasing in innovation processes that target 1.) the reduction of the demand for caustic products relying on the chloralkali process and 2.) phasing out the use of chlorine in other products and production pathways. In accordance with the Cradle to Cradle principles, the organization proposes eco-designed products to support customers in the development of their eco-design solutions, or materials intended for eco-designed products.

We commit ourselves to this Charter, according to objectives defined in its annex, and to publish regularly a statement on **our activities and progresses** to implement it. We are:

- ☐ A PVC user producing products for the building and construction sector
- ☐ A PVC producer
- ☐ A VCM producer
- ☐ A chlorine producer
- ☐ A PVC auxiliary producer
- ☐ An after-use manager
- ☐ A distributor of construction products
- ☐ A purchaser of construction products/construction project contractor
- ☐ A company in the process of phasing out irresponsible use of PVC
- ☐ A company having phased-out irresponsible use of PVC
- ☐ Other, please specify: _____

Date and location	Name and position	Signature

Annex to the Charter for *Responsible Use of PVC*™ and chlorine management

1. As an industrial company using PVC

1.1 *Safe formulation for defined applications:*

1.1.1 We use PVC for immobile and traceable applications in the construction and infrastructure sector, namely pipes and tubes, doors, window frames and flooring.

1.1.2 We use optimized, non-heavy metal-based heat stabilizing systems.

1.1.3 When we need plasticizers in our applications, we do not use short chain phthalates up to DEHP, and long chain ortho-phthalates are being phased out and substituted with alternative chemicals with more favorable health profiles.

1.1.4 The residual Vinyl Chloride Monomer (VCM) content in PVC products that we purchase is below 1 ppm.

1.1.5 We give preference to PVC produced by producers fulfilling the conditions 2.1-2.8.

1.1.6 In accordance with the C2C certification standard, we don't reintroduce post-use formulated PVC products containing toxic heavy metals into applications relying on dilution in new PVC products.

1.1.7 When we involve post-use formulated plasticized PVC as raw material, quality control applies for assuring that contamination with long chain ortho-phthalates doesn't exceed 1000 ppm.

1.1.8 We support technology development for transitional recycling of legacy PVC in infrastructure products (after removal of plasticizers in the case of plasticized products).

1.2 Commitment to innovation:

1.2.1 We are reviewing our processes and commercial relationships for possibilities to 1.) support the reduction of the demand for caustic products relying on the chloralkali process and 2.) phasing out the use of chlorine in other products and production pathways. For this purpose:

- We prefer non-chlorinated organic contributors to the composition of products (e.g. coloring agents), irrespective of whether or not these products contain PVC.
- We request that direct suppliers evaluate alternatives to caustics originating from chloralkali processes.

1.2.2 In accordance with the C2C principles, the organization proposes eco-designed products to support customers in the development of their eco-design solutions, or materials intended for eco-designed products.

1.3 Take-back system and recycling:

1.3.1 We commercialize our products fulfilling the conditions of safe formulation (see 1.1) with:

- an after-use management guarantee,
- a strategy for post-use identification of their material composition,
- a concept for recycling that maintains the integrity of the PVC molecule and doesn't induce demand for products of the chloralkali production.

1.3.2 We actively take back post-industrial and post-installation residues and recycle them in products of the same generation.

1.3.3 We commit to initiate or support existing networks to establish an infrastructure for:

- Reconditioning products fulfilling the conditions of safe formulation (see 1.1), so that they can be recycled into next generation products also fulfilling these conditions.
- Upcycling legacy materials that don't fulfil the conditions of safe formulation (see 1.1).

1.4 *Communication*

1.4.1 We encourage the use of sodium hydroxide and potassium hydroxide obtained from alternatives to sodium chloride, wherever possible.

1.4.2 We broach the issue of halogenated product components, wherever possible.

1.4.3 We publish long-term environmental and social objectives and a roadmap in which implementation of the present charter is addressed.

1.4.4 We actively support the implementation of the charter in our communication towards suppliers, professional organizations and broader industrial circles.

1.4.5 We regularly publish a statement on our specific intentions and results to implement the present charter with facts and figures on evolution since the former statement.

2. As a company producing PVC

2.1 We produce PVC products that do not rely on chlorine originating from mercury or asbestos diaphragm-based chloralkali processes, unless their substitution by membrane chloralkali technology is publicly announced for implementation in the near future.

2.2 We produce our PVC products without alkylphenol ethoxylate, bisphenol A, azo-initiators and copper-containing polymerization auxiliaries or have quantified plans for their phase-out.

2.3 We rely on a vinyl chloride monomer production consisting of ethylene chlorination, ethylene oxochlorination, and ethylene dichloride cracking in integrated facilities.

2.4 Our production is fully integrated from chlorine to PVC production in facilities under our management.

2.5 We use chlorine exclusively for PVC production or declare publicly with quantified objectives (timeline, share displacements) our intention to do so.

2.6 We offer PVC only to industrial destinations for immobile and traceable applications in the construction/infrastructure sector (see 1.1.1) or declare publicly with quantified objectives (timeline, share displacements) our intention to do so.

2.7 We participate in programs for definition of “Best Available Technologies” (BAT) and align our company’s performance with BAT benchmarks.

2.8 We report on our performance and progress towards the target of defined and safe interactions with the environment (both business and physical), using qualified and quantified evidence.

3. As an industrial company producing auxiliaries used for formulation of PVC

3.1 We provide customers using PVC with auxiliary products and information on their immediate and indirect environmental and health impacts, both backwards in our supply chain and forwards in the context of our customers’ products.

3.2 We report at the company level whether and in which ways we rely on a demand for caustics produced by chloralkali process, and state the chloralkali process type and the identity of the process owner.

4. As a company managing PVC applications after-use

4.1 We contribute with logistics and process engineering to the after-use management of products produced acc. to the specifications of section 1. We demand access to all information on PVC-containing products which is necessary for their separation, clustering and reconditioning so that we may generate defined materials which are reusable in the original industries.

4.2 We demonstrate in verifiable written statements our capabilities to contribute to reaching the objectives of this charter or our plans to develop these capabilities once the use phase of PVC products produced acc. to the specifications of section 1 is over.

5. As a company stopping the irresponsible use of PVC

5.1 We phase out PVC from irresponsible uses (PVC applications not encompassed in 1.1.1), e.g. short-term, mobile applications, or publicly declare our intention to phase-out irresponsible PVC uses, and actively contact suppliers for offers of potentially suitable alternatives.

6. As a distributor or purchaser of construction products/contractor

6.1 We purchase and sell or use PVC products fulfilling the conditions for responsibly used PVC listed under 1 or declare publicly our intention to prefer such products.

Background on the Charter for a *Responsible Use of PVC*™ and Chlorine Management: Back to the roots.

PVC was invented in 1835 by the French chemist Henri Victor Regnault who had been visiting Justus von Liebig in Gießen (Germany). It was re-discovered independently by the German chemist Eugen Baumann in 1872. It was however patented only on July 4th, 1913 by the German chemist Friedrich Klatte.

PVC was originally industrially developed to manage chlorine, a by-product of the caustic soda and caustic potash production. By "depositing" chlorine in PVC resin instead of using it e.g. for chemical weapon production, a productive management of chlorine's toxicity was supposed to be achieved.

PVC started to be commercialized in the late 1920s. Today, worldwide, about 35 million tons of PVC are produced annually, making it to the third most important plastic resin after polyethylene (PE) and polypropylene (PP).

On July 4th, 2013, the 100th anniversary of the PVC patent, Michel Giannuzzi, CEO of the French company Tarkett and Michael Braungart, the German founder of the Environmental Protection Encouragement Agency continued the German/French PVC story: they met to exchange on PVC, its past and present and especially on PVC's future. The commitment of Tarkett to this document was renewed in 2020 by Fabrice Barthélemy, CEO of Tarkett at this time.

The present charter emerged from this meeting. It is a tool for redirection of PVC use and chlorine management on original intentions at the dawn of industrial PVC development.

PVC's technical properties make it attractive for a broad range of applications. The PVC industry, one of the largest users of chlorine, has however been very much criticized by NGOs for the negative impacts of its production, use and post-use handling praxis on human health and the environment.

Among the potential issues are the use of ortho-phthalate plasticizers, heavy metal stabilizers, the possibility of dioxin- and furan formation during combustion and production issues (e.g. mercury cell process).

In the last decade, a lot of work has been done to address these potential issues. There are e.g. meanwhile good options for the replacement of ortho-phthalate plasticizers and heavy metal stabilizers.

Caustic soda is one of the most demanded industrial chemicals ever. It is used ubiquitously, especially in industries including the paper/pulp, chemical (detergent) and the mining industry. There is currently no good alternative for caustic soda replacement in these industries considering the high purity that many applications require. The same applies to caustic potash obtained from potassium chloride. Therefore, as a matter of fact, chlorine, the by-product of their production with chlorine alkali processes, will continue to be produced for a long time.

The resilience of PVC to degradation of any type under low temperature conditions qualifies it for durable goods. As a thermoplastic, it can be easily reprocessed to new durable products without liberation of chlorine which makes up more than 50% of its weight. With respect to post-use handling, goods that are durable and immobile during the use phase like window frames, pipes and flooring can be effectively collected and managed for reuse for defined new products. Different recycling programs are in place to recover post-industrial and partly even post-use PVC.

PVC is also used for widely spread and easily lost applications which can hardly be managed safely and productively after use. These applications represent quantitatively minor destinations for PVC. However, they are problematic when:

- they end up in form of acidic fumes of waste incinerators. A major application of caustic soda is the neutralization of acidic fumes resulting from the combustion of waste flows containing PVC and other chlorinated organic compounds. This further enhances caustic soda demand, the generation of chlorine and the production of PVC needing to be managed properly
- post-use collection completely fails and it is burnt in open fires generating dioxins
- they end up in landfill and continue leaching and off-gassing
- they contaminate other material flows and impede their proper post-use management

This represents a fatal deviation from the original intention of industrial and commercial PVC developers. Major players on the PVC market have realized these issues and feel the need to refocus PVC and chlorine management on original intentions.