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

Chlorine, a toxic gas, is generated as by-product of the production of caustic products sodium and potassium hydroxide with the chloralkali process. If the demand for these caustic products prevails and alternative offers relying on other production forms are lacking or lacking suitability, converting chlorine only to PVC produced with best available technology and used only for goods designed with safe materials and a manageable post-use recycling chain in place is the best solution for management of chlorine.

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 Chlorine Monomer (VCM) content is very low.
- **Safe additives:** Used heat stabilizing systems are optimized for safety and don't rely on toxic heavy metals. When plasticizers are needed, they don't belong to phthalates but to modern products with much better safety profiles.
- **Applications:** PVC is used exclusively for applications in the construction sector like pipes, tubes, doors, window frames, flooring. These products are indeed best predisposed 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 is reviewing its processes and commercial relationships for possibilities to substitute chlorinated organic chemistry and the demand for caustic products relying on the chloralkali process.

We, _____, support the distinction of "Responsibly used PVC" in production, commercialization, sourcing practices and legislation. We commit ourselves to this Charter, including 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 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, short chain phthalates up to DEHP have been already phased out or have never been used and long chain phthalates are being phased out for substitution for modern alternative chemistry with more favorable health profiles.

1.1.4 The residual Vinyl Chlorine 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.

1.1.7 When we involve post-use formulated plasticized PVC as raw material, quality control applies, contamination with long chain phthalates doesn't exceed 1000 ppm or we have action plans towards this objective in place and we communicate these facts in the corresponding documentation on our products.

1.1.8 We don't reintroduce post-use formulated PVC products containing toxic heavy metals into applications relying on dilution in new PVC. 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 substitute chlorinated organic chemistry and the demand for caustic products.

- We prefer non-chlorinated organic contributors to the composition of their products (e.g. coloration agents).
- We demand from direct suppliers that they explain why used caustics originating from the chloralkali process are involved for the case being.

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 guaranty,
- a possibility to recognize their composition after use,
- 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 take post-industrial and post-installation residues actively back 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 publish regularly 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 company producing PVC

2.1 We produce PVC products that are not relying on chlorine originating from mercury or asbestos diaphragm-based chloralkali processes unless the substitution by membrane chloralkali technology is publicly announced for implementation on short notice.

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, 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 performance and distance to the target of defined and safe interactions with the Environment (business and physical) with qualified and quantified evidences.

3. As 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 distant environmental and health impacts backwards in our supply chain and forwards in the context of the product of our customers.

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 on the chloralkali process type and the identity of the process owner.

4. As 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 specifications of section 1 and demand access to information on PVC containing products that is necessary for separation, clustering and reconditioning in a way that we can generate defined materials 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 specifications of section 1 is over.

5. As 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 the intention to phase-out irresponsible PVC uses and call actively potential suppliers for offers of potentially suitable alternatives.

6. As 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 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 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 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 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 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.