INEOS Inovyn

A Solution for PVC cables waste Legacy Additives Extraction

Project Circle

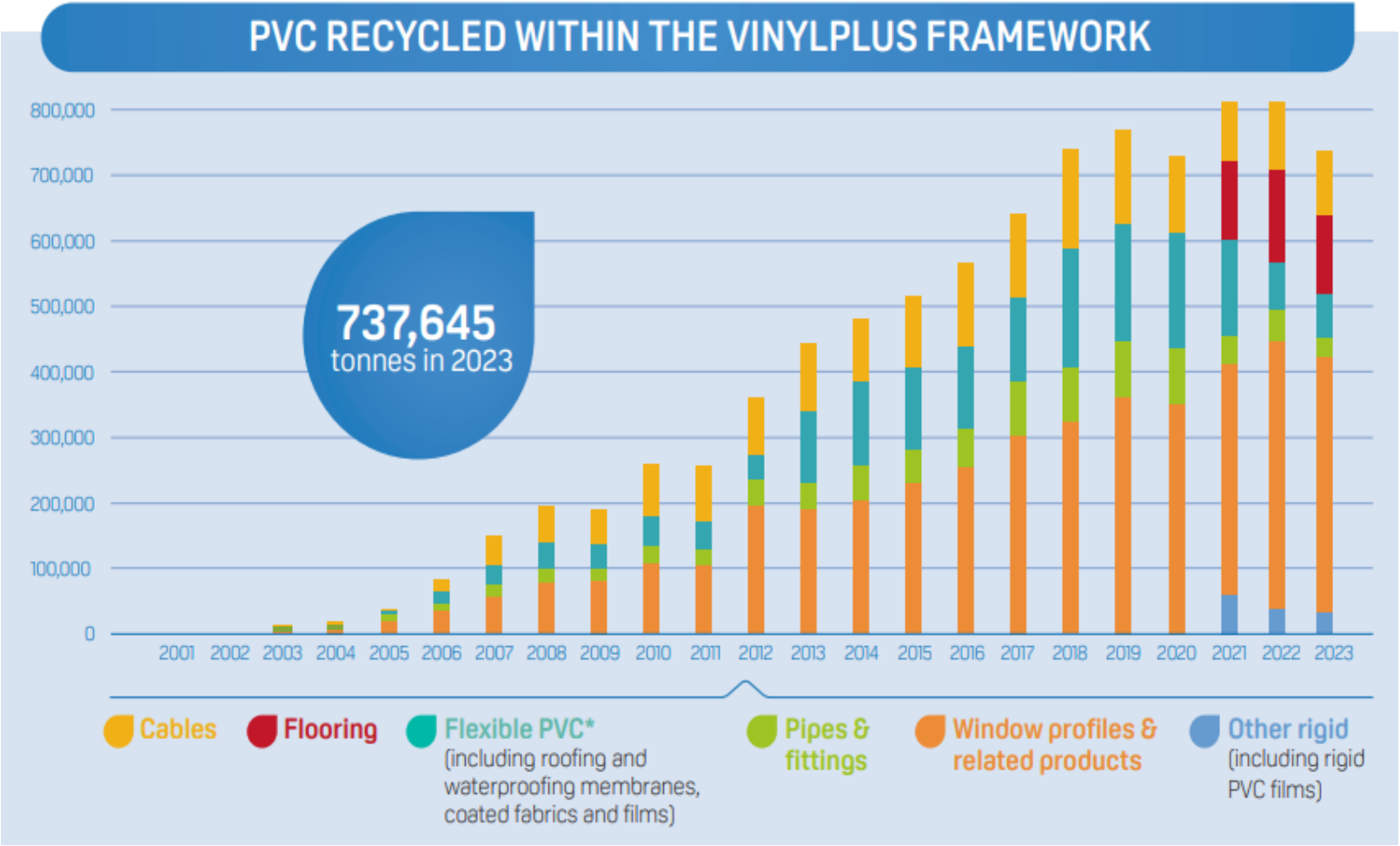
PVC Forum Italia
March 26, 2025

Advanced recycling technology development

Project Circle roadmap

- **Objective**
  - Develop the technologies to recycle all PVC that's non mechanically recyclable
- **Aim**
  - Development of Dissolution, Pyrolysis and Gasification technology
  - First industrial dissolution technology plant by 2030
- **Feedstock**
  - Focuses on hard-to-recycle PVC waste, including composites and ones with legacy additives
  - Need for sorting on PVC application and presence/absence of legacy additives

Mechanical recycling of cables



Tonnage recycled 2023			
	Total	**Post-consumer**	Pre-consumer
Cables	97 586	**88 345**	9 241

Tonnages of PVC recycled in the EU-27 plus Norway, Switzerland and the UK, within the operations of Recovinyl AISBL in the framework of VinylPlus

REACH Regulations - Stabilizers and Plasticizers

Restrictions for materials placed on the market or used in PVC articles

- **Lead - Recycled flexible PVC**
  - Concentration limit: < 0.1wt% (1000 ppm)
  - Effective date: May 28, 2025

- **Lead - Recycled rigid PVC**
  - Concentration limit : < 1.5wt% (15000 ppm)
  - Exemption until May 28, 2033 → To be reviewed in 2028

- **Cadmium**
  - Concentration limit: < 0.01wt% (100 ppm)

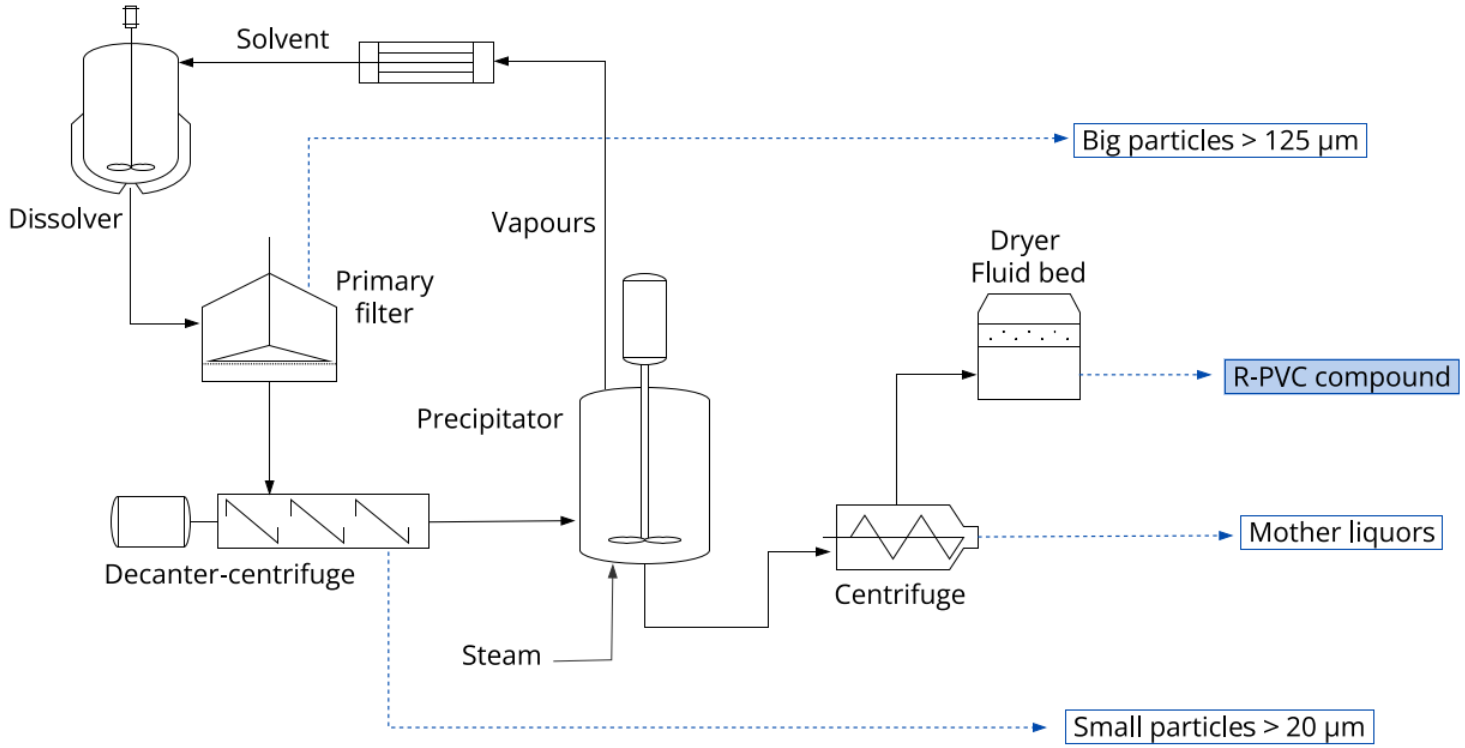
- **Plasticizer (Since 2019)**
  - Sum of DEHP/DOP, DBP, DIBP, and BBP: ≤ 0.1wt% (1000 ppm)
  - An exemption is possible in articles with EU authorisation.

Vinyloop technology, industrial operation

Vinyloop plant closed due to REACH evolution on DEHP/DOP, DBP, DIBP and BBP

Vinyloop[tm] plant – Ferrara
2002 - 2018

- 2002-2018: Vinyloop® Industrial plant at Ferrara (Italy)
  - >15 years years of industrial experience with **Cables** & Tarpaulins
  - Fibers separated from PVC compound
  - Elimination of residual contaminations
  - Production of rejuvenated PVC compound
- Nominal capacity
  - Waste input : 10 000 T
  - Rejuvenated-PVC: 8 500 T



- Plant closed and dismantled due to REACH evolution on *legacy additives*
  - Plant not designed for the extraction of additives (stabilisers, fillers, plasticisers, etc.) from the PVC compound

Dissolution technology development

From Vinyloop^{tm} to Vinyloop^{tm} -D technology

- Extraction legacy additives from cables or other PVC applications
  - Lab-scale testing
    - Extraction Pb / Cd / DEHP/DOP, DBP, DIBP and BBP confirmed → *REACH compliant*
  - Pilot plant testing
    - Two pilot plants in operation at R&D centre in Jemeppe-sur-Sambre (B)

      → *Legacy additives extraction efficiency confirmed*
- Industrial operations
  - Aim: first industrial unit by 2030
  - Use of Vinyloop Ferrara industrial design, with the integration of extraction technologies

Dissolution technology development

From Vinyloop^{tm} to Vinyloop^{tm} -D technology

- Walloon consortium CIRCPVC
  - Covers the entire chain, from collecting PVC waste at construction-demolition sites → to produce rPVC not containing legacy additives

- Belgium national consortium DISSOLV
  - Demonstrates circularity of flexible PVC waste (flooring, carpets and tarpaulins) and reuse all extracted additives.

What else?