

PVC – a Circular Material for Future

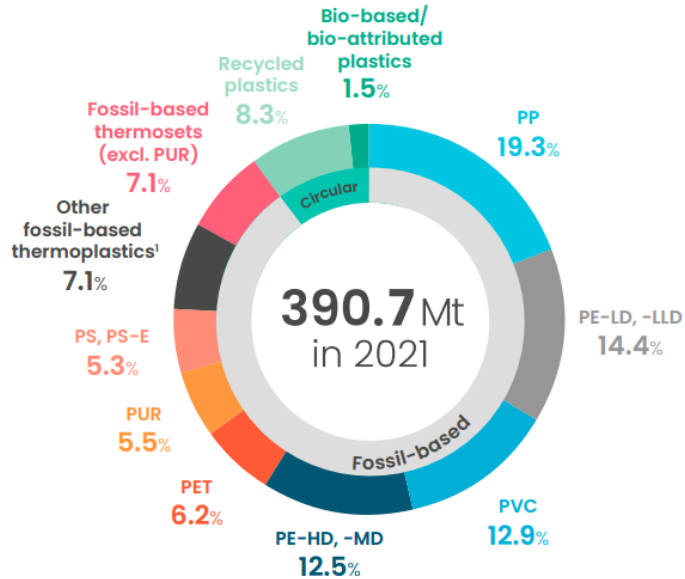


Basic Information about PVC & Its application

PVC – a Circular material for future

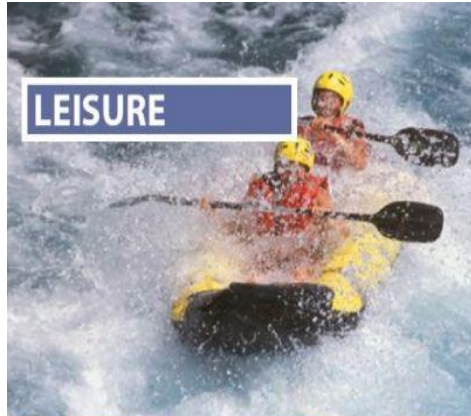
PVC – a Circular Material for Future

Basic Information – Poly Vinyl Chloride



- A competitive and attractive option for many end-use applications, including construction, infrastructure, agricultural, electrical, automotive, and healthcare products
- Its versatility, durability, self-extinguishing properties, chemical and oil resistance, mechanical stability.
- PVC resin can easily combine with many solvents and additives and can be compounded or fabricated into a wide variety of forms.

PVC & Its application



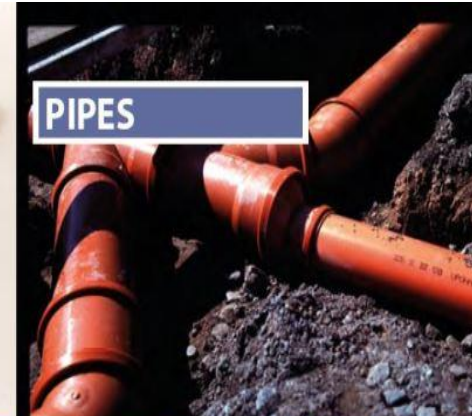
LEISURE



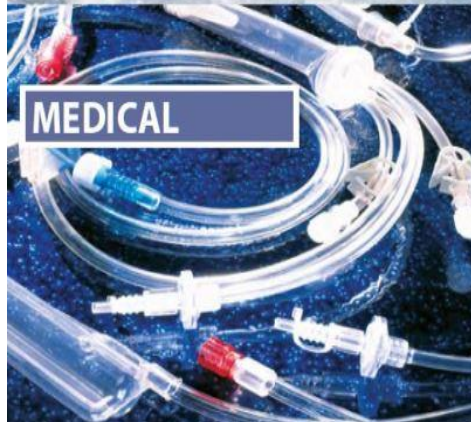
CABLES



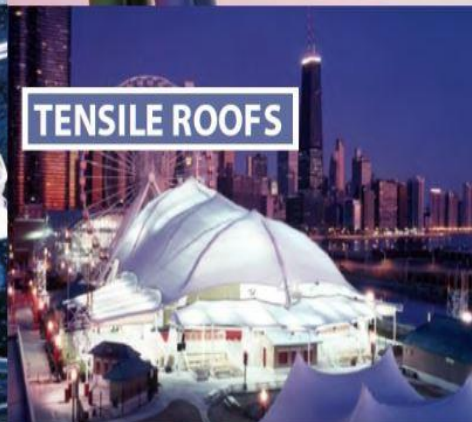
PACKAGING



PIPES



MEDICAL



TENSILE ROOFS



FLOORING



WINDOWS

Basic Information about PVC & Its application

PVC – a Circular material for future

- >. **Circular Feed stock**
- >. **Conversion & Design for Circular Economy**
- >. **Disposal & Waste management**

PVC – a Circular Material for Future Plastic & its Circular Economy

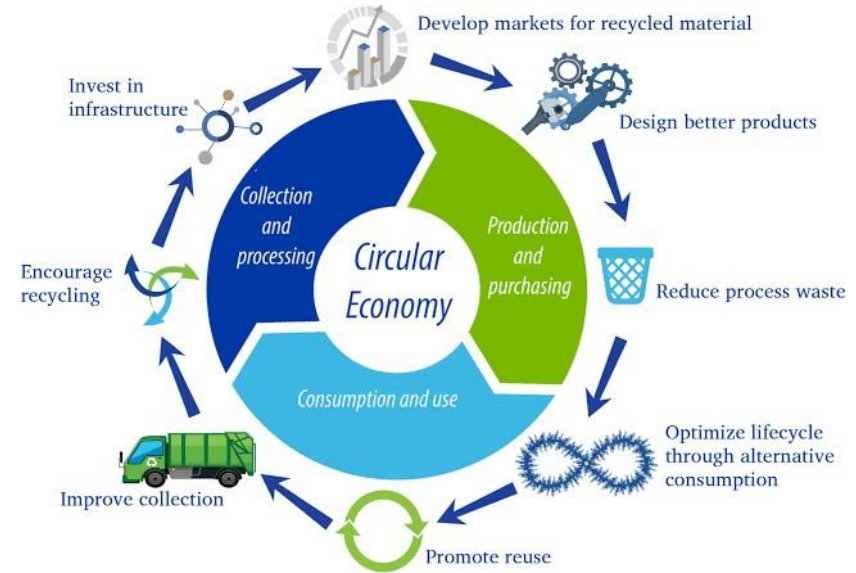
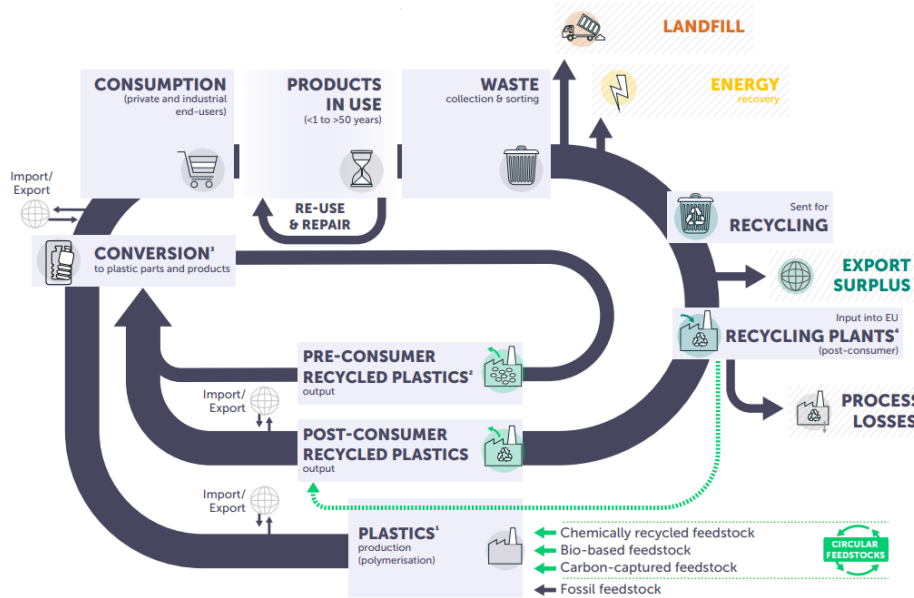


Image: Sustainable Global Resources Ltd. Recycling Council of Ontario

- >. Circular Feed stock → Circular Material
- >. Conversion & Design for Circular Economy → Reduce, Reuse & Repair
- >. Disposal & Waste management → Recycle

The PVC production process consists of 5 steps:

- The extraction of salt and hydrocarbon resources
- The production of ethylene and chlorine from these resources
- The combination of chlorine and ethylene to make the vinyl chloride monomer (VCM)
- The polymerisation of VCM to make poly-vinyl-chloride (PVC)
- The blending of PVC polymer with other materials to produce different formulations
→ providing a wide range of physical properties.

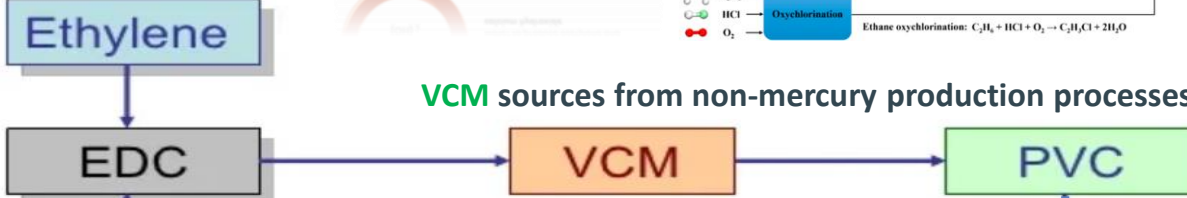
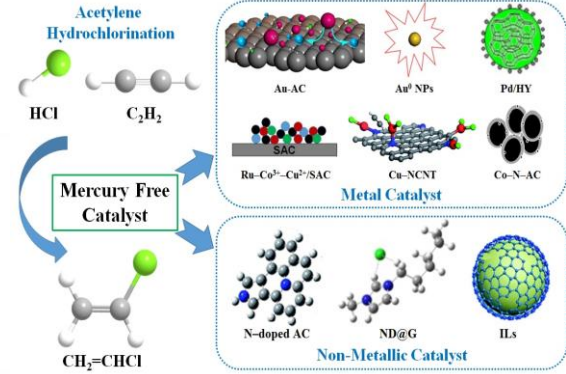
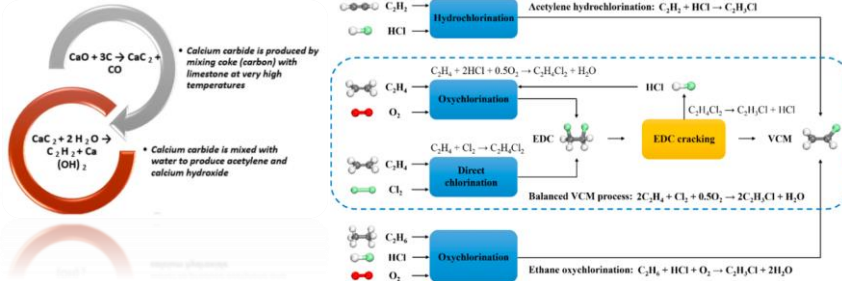


PVC – a Circular Material for Future

PVC – Responsible care product framework

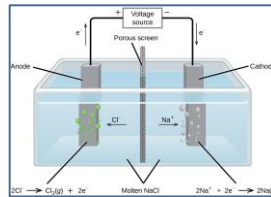


- Non-Renewal source
- Bio-based Renewal source



EDC and VCM, as well as PVC resin, shall be sourced from **Closed lid production manufacturing plants**

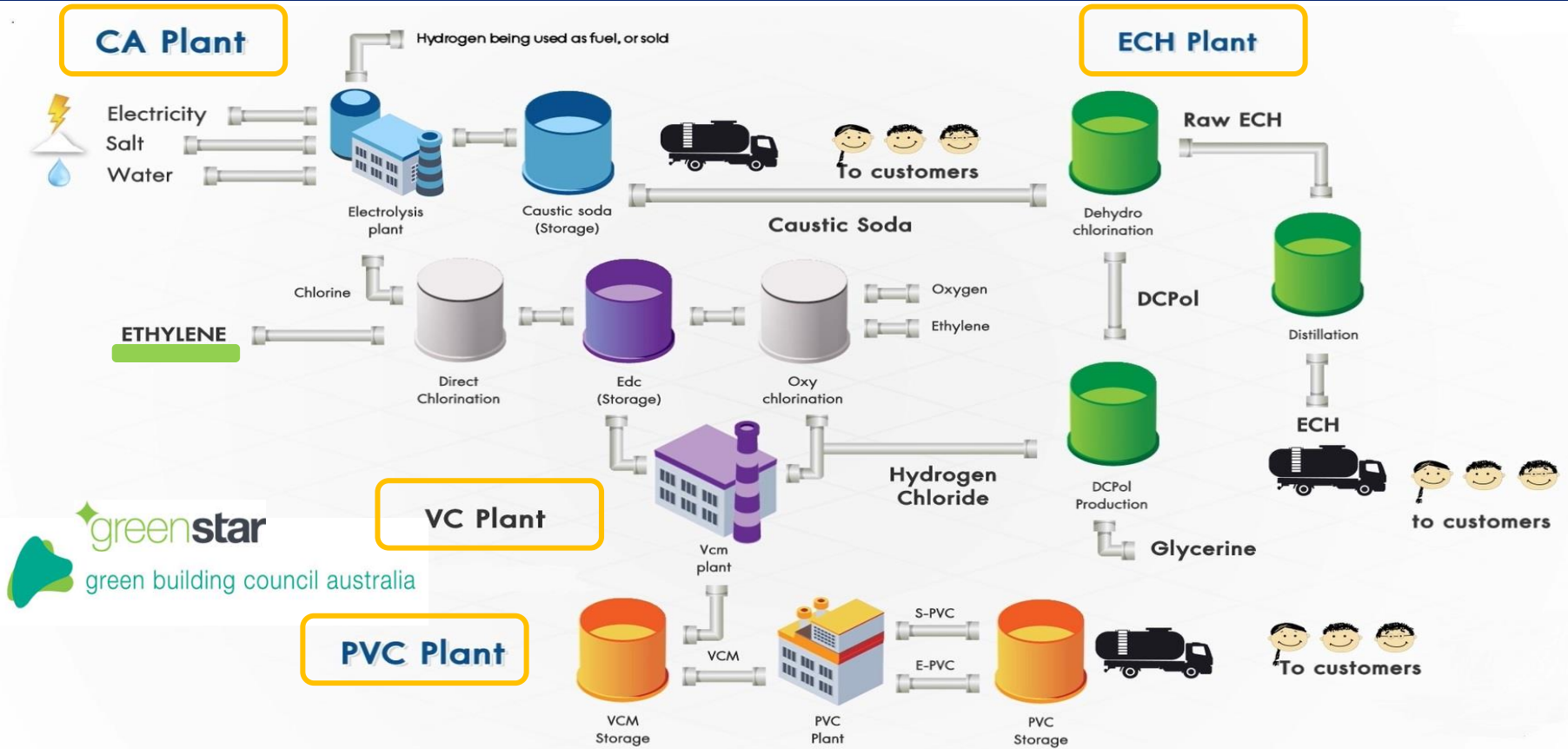
57% of PVC is made of Chlorine



Chlorine sources from membrane cell, non asbestos diaphragm or modified diaphragm chlorine production processes



AGC Vinythai (MTP-1) Plant process



Energy Conservation and Reduction of CO2 in the Manufacturing Process

The Company promotes energy conservation activities in production processes that are always linked to GHG emission reduction. These activities include **simplifying exhaust gas treatment by converting from heavy oil to natural gas or from natural gas to hydrogen;** **improving production processes through total oxygen combustion and other techniques, and conducting utility-related energy conservation assessments.**

Reduction of Greenhouse Gas Emissions

Realizing the more energy consumption is reduced, the less CO2 is emitted, AGC Vinythai continually puts its effort into various initiatives in energy reduction project. For example; the company decided to invest new equipment with **non-CFC refrigerant** to avoid Chlorofluorocarbon (CFC), one of greenhouse gases, emission by 2025.

Certificate Number:
TGO CFO FY23-04-136

**องค์การ
rganization**
2

**THAILAND GREENHOUSE GAS
MANAGEMENT ORGANIZATION**
(Public Organization) **TGO**

CERTIFICATE
Awarded to

NR Instant Produce Public Company Limited

Company address verified: 99/1 Moo 4, Kaerai, Kratumbaen, Samutsakorn 74110

Thailand Greenhouse Gas Management Organization certifies that the quantity of Greenhouse Gas of the above organization has been verified by School of Energy and Environment University of Phayao and found to be in accordance with the requirements of the standard detailed below.

Standard

TGO Guidance of the Carbon Footprint for Organization

Verification Period: [01/01/2022 - 31/12/2022]

Total Greenhouse Gas Emission (Scope 1&2):	3,817	tonCO ₂ e/year
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Direct GHG emissions	2,649	tonCO ₂ e/year
Energy Indirect GHG emissions	1,168	tonCO ₂ e/year
Other Indirect GHG emissions	6,558	tonCO ₂ e/year

The agreed level of assurance is: Limited, at materiality of 5%
Registration Date: 31 May 2023

Mr. Kiatchai Maitrивong
Executive Director
Thailand Greenhouse Gas Management Organization (Public Organization)

Basic Information about PVC & Its application

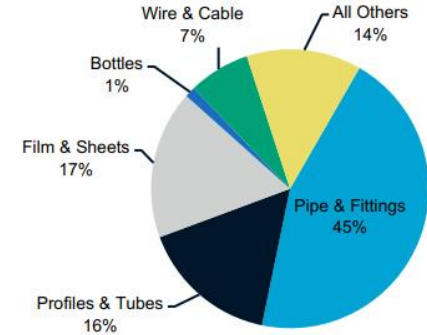
PVC – a Circular material for future

- >. Circular Feed stock
- >. **Conversion & Design for Circular Economy**
- >. Disposal & Waste management

PVC – a Circular Material for Future Conversion & Design for Circular Economy



World: 2022 PVC Demand



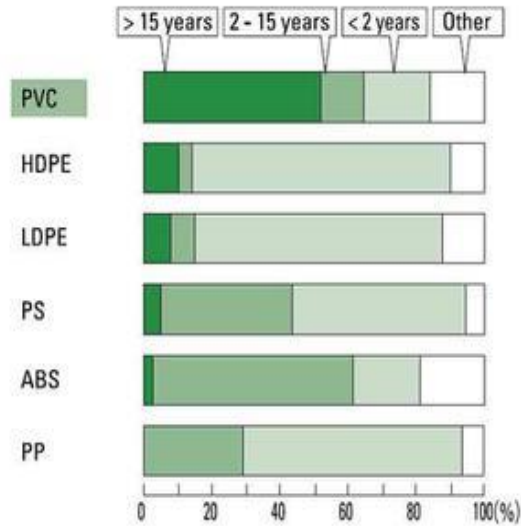
Demand = 48.7 Million Metric Tons

Source: Chemical Market Analytics by OPIS © 2022 Oil Price Information Services, LLC.

Figure 1: European (EU27+3) plastics demand by segment and resin type 2020 (Total 49.1 Mt). Source: PlasticsEurope Market Research Group (PEMRG) and Conversio Market & Strategy GmbH. Quoted from: (PlasticsEurope 2021b)

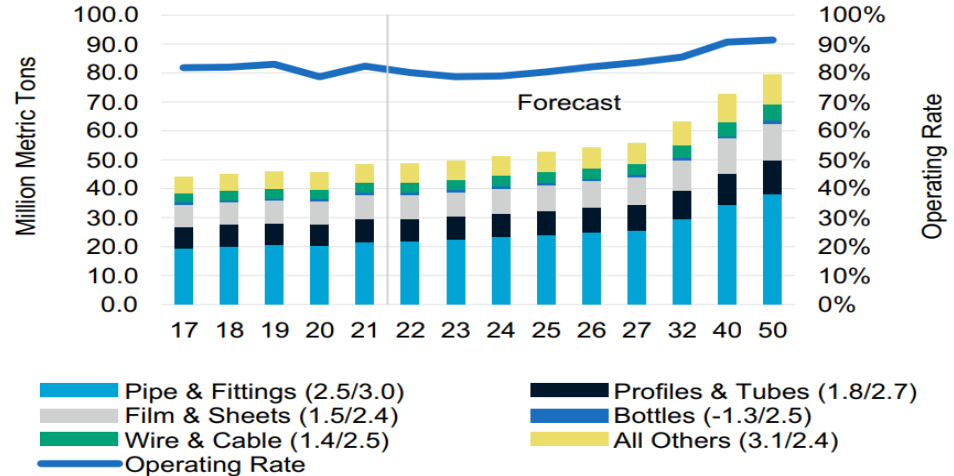
- **40.5% of Global plastic demand applied for Packaging and Over 35% applied for Durable goods** ie. Building & Construction, Automotive, and Electrical & Electronics
- **PVC demand applied for Building & Construction material.**
over 70% of PVC demand applies for durable goods (long-life applications)

PVC – a Circular Material for Future Conversion & Design for Circular Economy



Source: Prepared from "A plastics demand structure survey report" by the MITI

World: PVC Demand



(% AAGR = 17-22/22-32)

Source: Chemical Market Analytics by OPIS

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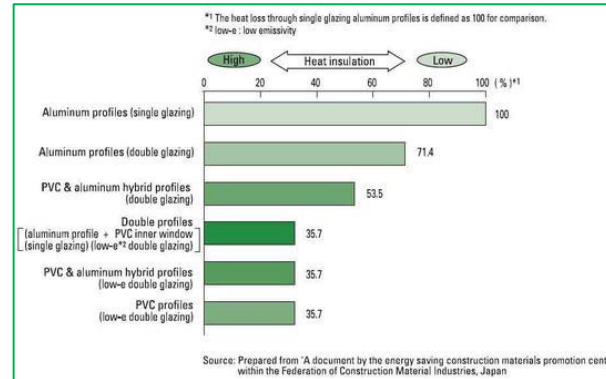
- **PVC sustainability and recycle,**
over 70% of PVC demand applies for durable goods (long-life applications)
- Substitutes material include various polymers, glass, wood, aluminium, steel, iron, and concrete
- Growing demand in Flooring – Wood, Tile, and Carpet replacement

PVC – a Circular Material for Future Product Design for Sustainability

PVC FORMULATION – RIGID PVC BASICS

Function	Ingredient	Role Within Formulation
Base Resin	PVC Resin	Basic properties
Heat Stability	Organotin Heat Stabilizer	Thermal stability, PVC resin can be easily degraded by exposure to high temperatures
Internal Lubricant	Calcium Stearate	Helps to process PVC by promoting PVC particle breakdown
External Lubricant	Paraffin Wax	Helps regulate extrusion process
External Lubricant	PE / OPE Wax	Helps regulate extrusion process / metal release
Fusion Promotion Melt Strength	Process Aid (PLASTISTRENGTH®)	Helps molten PVC compound maintain integrity during processing / promote fusion as needed
Impact Resistance	Impact Modifier (DURASTRENGTH®)	Provides PVC articles with improved toughness
Filler	Calcium Carbonate (0.7 µm)	Used for cost reduction in PVC processes. May help, or hurt certain physical properties
Pigment / UV Protection	Titanium Dioxide	Provides protection from UV light
Color	Pigments / Colorants	As Needed

Source : Arkema



ท่อกพีวีซีแข็งสำหรับใช้เป็นท่อน้ำดื่ม

ท่อกพีวีซี น้ำดื่มต้องใช้สีฟ้า!

ท่อกพีวีซีแข็ง คือ วัสดุที่ทำจากเม็ดพลาสติก PVC ที่ผ่านการบำบัดด้วยรังสีแกมมา 250kRad เป็นที่นิยมใช้สำหรับผลิตขวดน้ำดื่ม และขวดน้ำดื่มร้อน

เลือกซื้อ เลือกใช้ ให้ปลอดภัย

เลือกซื้อท่อกพีวีซีแข็ง 250kRad เลือกใช้ท่อกพีวีซีแข็ง 250kRad เลือกใช้ท่อกพีวีซีแข็ง 250kRad เลือกใช้ท่อกพีวีซีแข็ง 250kRad

ท่อกพีวีซีสำหรับน้ำดื่ม

เลือกซื้อ เลือกใช้ ให้ปลอดภัย

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4.1 วัสดุที่ใช้ทำท่อก ต้องเป็นดังนี้

4.1.1 เรซิน

- 4.1.1.1 ต้องเป็นพอลิไวไนลคลอไรด์เรซินบริสุทธิ์ (virgin resin) ประเภทใช้ผลิตผลิตภัณฑ์ทั่วไปรวมถึงภาชนะและวัสดุห่อหุ้มอาหาร
- 4.1.1.2 ต้องมีปริมาณไวไนลคลอไรด์มอนอเมอร์คงค้าง (Residual Vinyl chloride monomer, RVCM) ไม่เกิน 1 mg/kg
- 4.1.1.3 ไวนิลคลอไรด์มอนอเมอร์ที่นำมาทำพอลิไวไนลคลอไรด์เรซินต้องมาจากแหล่งผลิตที่เป็นกระบวนการผลิตที่ไม่ใช่ปรอท

ผู้ทำต้องพิสูจน์หรือแสดงเอกสารรับรองคุณภาพหรือผลวิเคราะห์จากสถาบันที่เชื่อถือได้หรือหน่วยทดสอบที่สำนักงานมาตรฐานผลิตภัณฑ์อุตสาหกรรมประกาศ

ตารางที่ 6 ปริมาณของสารที่สกัดได้ (ข้อ 6.3 และข้อ 9.13.3.4)

สารที่สกัดได้	ปริมาณของสารที่สกัดได้ (mg/dm ³)	สารที่สกัดได้	ปริมาณของสารที่สกัดได้ (mg/dm ³)
ปรอท	0.001	โซยานินด์	0.07
ตะกั่ว	0.01	แคดเมียม	0.003
สารหนู	0.01	แบเรียม	0.7
ซิลิเนียม	0.01	ปริมาณสารที่ละลายทั้งหมด (total dissolved solid)	70
โครเมียม	0.05		

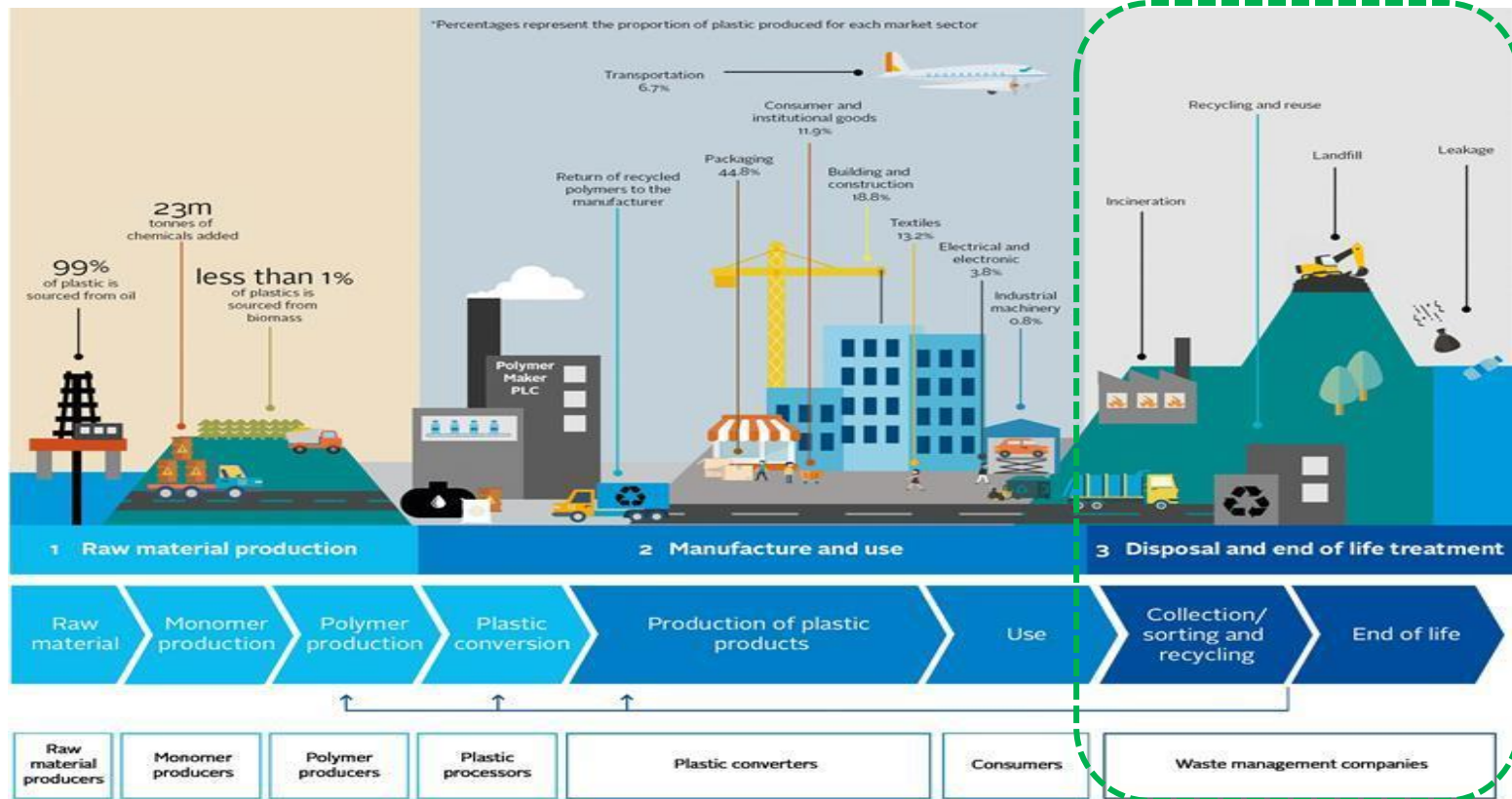
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Disposal Phase : Waste Management & Recycle



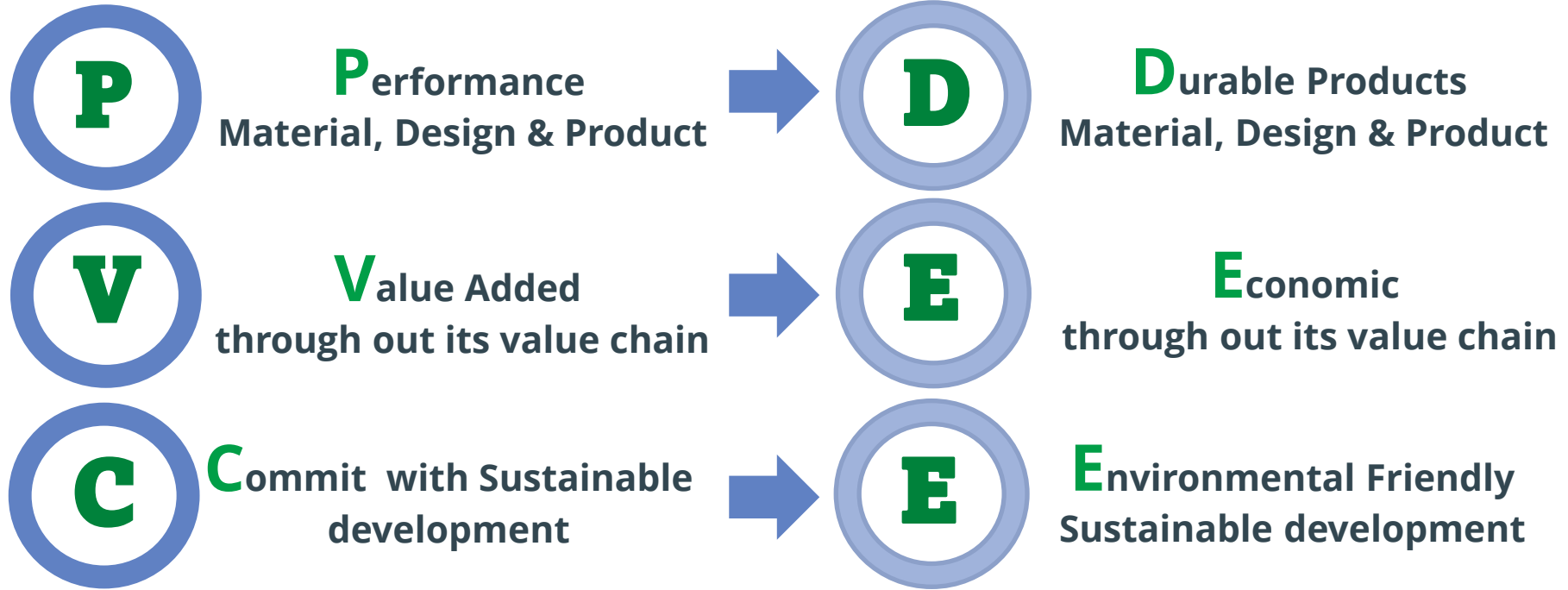
Plastic Product Recycling Process



- PVC is challenging to recycle due to its chlorine content,
- 3% of global PVC - through mechanically recycling



- **Recycled PVC (rPVC)** used in conduit, non-pressure pipe, vinyl siding, Flooring, tubing, credit card, and road management devices like traffic cone



PVC = DEE (ดี)

1. British Plastic Federation
link : [Polyvinyl Chloride PVC \(bpf.co.uk\)](https://www.bpf.co.uk)
2. The European Council of Vinyl Manufacturers - ECVM
link : [The European Council of Vinyl Manufacturers - ECVM \(pvc.org\)](https://www.pvc.org)
3. GBCA- Best Practice verification guide
link : [Best Practice Guidelines - Verification Guidance Document \(gbca.org.au\)](https://www.gbca.org.au)
4. Plastic : The Fact 2022
link : [PLASTICS-THE-FACTS_FINAL_DIGITAL.pdf \(plasticseurope.org\)](https://www.plasticseurope.org)
5. Eco-profiles and Environmental Product Declarations of the European Plastics Manufacturers
link [230628 Eco-profile-PVC june23.pdf](https://www.plasticseurope.org)
6. World Analysis, Vinyls , 2023 Edition, Chemical Market Analysis



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